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EDITORIALS

THE ORIGIN OF LIGHTNING.

Since the time of Benjamin Franklin man has known that lightning consisted of an electrical discharge, very similar to those which may be made to take place in the laboratory. Lightning discharges may take place between a cloud and the ground, or between two clouds. Such an electrical discharge involves the combination of positive and negative charges which previously existed separately upon the two bodies between which the discharge takes place. After the discharge the two bodies will be electrically neutral, or at least more nearly neutral than they were initially. The mechanism by which bodies in the laboratory are given an electrical charge is well known, but what is the mechanism by which clouds are charged to millions of volts? For the electromotive forces which produce lightning discharges must be of colossal magnitude.

Various theories have been presented from time to time to account for the electrical charges which are accumulated by clouds, many of which have been widely discussed. Lightning phenomena are usually accompanied by heavy downpours of rain. It is well understood how the voltage of a cloud may be enormously raised by the combination of many fine charged particles of moisture into drops which are large enough to be precipitated to the earth. The large drop carries the combined charges of all the small drops which go to make it up, but its surface is very much less than the combined surfaces of the component droplets; hence the surface density of the electrical charge is very much greater. When the drop is large enough to fall and approaches the earth, the voltage may be high enough to cause an electrical discharge across the intervening space. But how are the original charges upon the tiny moisture particles produced?

The most plausible explanation for this has been advanced by Dr. George Simpson, who proved that when drops of water are broken up they become charged positively, while the surrounding air receives a negative charge. A thunder cloud is known to form in a rapidly ascending current of air, and if the velocity is as great as 26 feet per second the smaller drops will be carried upward, while even the largest drops will be unable to progress against the current. The larger drops break up in the air and become electrified, according to Dr. Simpson. If the ascending current spreads out laterally near the top of the cloud, the vertical velocity is diminished, the drops will grow and fall, but only to break again and repeat the process. Sufficient electricity might thus be accumulated to account for observed effects.

The rain which reaches the earth is sometimes charged positively and sometimes negatively, but more often positively, which is in accord with the above idea. This does not account for the fact that the earth, as a whole, is negatively charged, although local portions are at times positively electrified. There is still a great deal to be learned in connection with atmospheric electricity, but Dr. Simpson's hypothesis seems to offer an adequate explanation for the existence of thunder clouds and to be free from objections of a theoretical nature.

ORGANIZING BUSINESS.

The success of an electrical enterprise, whether it consist of merchandising, of installation work, or of running a central station, depends, just as in the case of any other kind of a business, largely upon an appropriate organization. To secure this organization is the function of the manager. Successful managers have been those who could pick out the best men for each part of the work and help them to develop to the point of greatest efficiency in carrying it out. Careful hiring makes less firing. Employees need to be encouraged and inspired, to have their initiative and resourcefulness cultivated, and to be properly rewarded for their efforts in order to develop an organization which will give the best results.

An organization, as well as individual ability and effort, is necessary. The head of each department must thoroughly understand what are his duties and what is to be done by each of the other departments, in order to have their separate activities properly gear together in the fullest measure of co-operation. One would often be surprised to find to what extent this element is lacking and to what extent the different departments are ignorant of what is expected of them and what they should expect of others. A great help in making this matter plain is the preparation of a chart or diagram showing the relation of each department to the others and listing their several duties and activities. An accompanying chart should show similar relations between the employees, indicating to whom each is responsible and under what head he is supposed to be operating. Instructions in writing as to the responsibilities of each head of a department, in regard to those general

matters which may be regarded as permanent disposals of business, are very desirable and occasional reference to them is of benefit. Where such matters have not been arranged systematically it would often be a cause for surprise if different heads were asked to make a statement as to exactly what matters come under their own jurisdiction and exactly what come under the jurisdiction of each other. And not infrequently the causes would be unearthed which have been leading to friction and misunderstanding between those who should be giving each other the fullest measure of assistance and support.

BRITISH MANUFACTURERS AND INDUSTRIAL RESEARCH.

Among the various schemes which have been suggested in England for securing more effective co-operation between manufacturing industries and scientific research, is one which has been laid before the Manchester Committee for the Organization of British Engineering Industry, by Mr. A. P. M. Fleming, after a visit to the United States. Mr. Fleming is connected with the British Westinghouse Electric Company, for which he has organized apprentice schools and systems at Trafford Park, Manchester; and he has paid a visit of inspection, observing research operations in large American private industrial establishments, where allocations for such work frequently amount to $125,000, $250,000 or even $500,000. He has advised British manufacturers to supplement their present or enlarged specialized laboratory efforts by setting up a large centralized institution where all can co-operatively concentrate upon advanced research from which large consequences may be expected to emerge. In such an institution there should be separate laboratories for each of the great industries, such as engineering, mining, shipbuilding, soap-making, dyeing, rubber, paper, metal, textile manufacturing and so on, all being centrally housed together, and much of the research there conducted would be along lines of pure-science investigation, with a view to securing priority of new applications to industry. Mr. Fleming suggests the taking out of patents on behalf of the British Government, British or colonial manufacturers being licensed at a nominal fee, to manufacture. The advantages to be secured by such a scheme, as compared with a system of isolated laboratories in different centers, were stated thus:

(1) Work would be done without the overlapping which inevitably occurs among a number of different institutions, and which results in great lack of economy.

(2) The administrative expenses would be at a minimum.

(3) As one research frequently leads to others quite unsuspected originally, if all the work were done in one building fresh investigations could be carried out with the least loss of time and the greatest possible efficiency.

(4) The difficulty of collecting information on problems considered would be reduced to a minimum by housing copies of all matter required in one library.

(5) The problem of distribution of information would in the same way give as little trouble as possible if handled by a bureau attached to the institution.

(6) It is of the greatest possible value to have a number of men engaged in research problems housed in one building, where opportunities arise for frequent meetings. The stimulus arising from intercourse in this way can scarcely be overestimated; in a system of isolated laboratories this is very largely lost.

Mr. Fleming reiterated the advice which has been urged upon British manufacturers many times during recent years, to boldly vote funds for industrial research, because such allocations form an excellent investment. Funds so voted pay for themselves, and a percentage of gross profits should be set apart to establish and maintain such a research laboratory.

When such suggestions have been made on former occasions the reply from some directions has been that British manufacturers, at any rate in the electrical industry, did not operate on a sufficiently large or profitable scale to enable them to spare large funds for such a purpose. This answer will not be tendered with the same credence attaching to it today, after 21 months of heavy work with extended factories and war profits. Indeed it may be said that such a scheme stands a better chance of acceptance today than it did before the war, though it was generally recognized long ago that whatever was being done separately and in a disconnected way in England, co-operative centralization and its benefits were lacking.

ANOTHER NEW ELECTRICAL-EXPORT RECORD.

Indicative of the exceptional prosperity prevailing in this country in the electrical industry as well as in nearly all other lines is the surpassing of a monthly output record which has but recently been established. On another page of this issue is given a summary of the electrical exports for last February, which shows that the foreign shipments approached quite close to $3,000,000 and exceeded by over six per cent the record made last November. As compared with February of 1915 the total was nearly 75 per cent greater. Another interesting fact disclosed is that for the first eight months of the present fiscal year the total electrical shipments have already exceeded those of the corresponding period in the fiscal year 1913-1914, thus indicating that a new twelvemonth total will be recorded before the close of June. With this gratifying showing it is desirable that redoubled efforts be made to maintain the standing that American electrical products are attaining abroad.

RECENT IMPROVEMENTS IN MOTOR DRIVING.

Increased specialization is an interesting and valuable feature of recent electric motor driving, notably in the textile field. The tendency is away from rigidity of connections, and the problem of reducing friction to the minimum is receiving deserved attention. A refinement which means not a little to the spinning-mill owner is the provision in a four-frame drive of a shaft of sufficient length to permit the horizontal adjustment of the pulleys to meet different widths of aisle between frames. By the use of ball bearings such a shaft with a direct-connected 20-horsepower motor can be driven by a motor of only one-sixth-horsepower rating, a feat which was greatly appreciated by visitors to the recent exhibition at the Boston convention of the National Association of Cotton Manufacturers. This means that the friction load, with the motor and shafting running at normal speed, but exclusive of the belts between shafting and frames, totals less than one per cent of the motor rating, and this represents a high degree of efficiency when applied to a large number of spinning frames. Even small savings in power per driving unit mount up when multiplied through a textile mill of the capacity now frequently found in this country.

The polyphase, brush-shifting type of motor is another comparatively new development, enabling the machine owner to enjoy the benefits of approximately constant torque over a considerable speed range. A novel feature of an equipment of this type consists of a pilot motor of nominal power which is mounted on the frame of the main motor and employed merely in shifting the brushes either automatically or in response to a push-button control arranged conveniently for the machine operator. Developments in the single-phase, brush-shifting motor are also interesting at present, a 2-to-1 speed variation being secured by gradual adjustment of brush position through hand or foot-operated control. The value of variable-speed characteristics for certain classes of work is not easily exaggerated, and the almost universal employment of alternating current for power supply over wide areas apart from city centers has long called for practicable equipment of this kind. Increased precision of service is now being realized in many cases through the employment of an ammeter installed integrally with the starting switch of the motor, such an instrument giving the mill superintendent a continuous and relatively inexpensive check upon the loading of the power unit, and hence throwing constant light upon the general productive efficiency of the major machinery.

It might perhaps be assumed that increasing specialization in motor drives militates against standardization and consequent low cost of power units. The field of motor application is so broad, however, that every step toward more accurate service benefits the industry as a whole. The electrical manufacturer has nothing to fear from any improvement in driving which enables motors of smaller power to perform the service of former units rated in higher figures. Increased popularization of the electric drive is bound to follow every improvement in efficiency, the parallel being clear from experience with modern incandescent-lamp evolution.

When the tungsten lamp was first introduced, great fears were expressed that the reduced consumption thereby made sufficient for the original amount of lighting would ruin the business of the central stations. In isolated cases a considerable falling off in output was experienced, but in the large majority of cases the new use created by the higher efficiency was more than enough to offset this.

ELECTROPLATING WITH NICKEL.

Nickel plating has been widely used to give a finished surface to articles made from other metals and to protect them from oxidation. It has been widely utilized for many years, and little change in the original methods of operation have been noted until recently. A few years ago other salts began to be used in place of the established double sulphate for plating baths and on account of their greater solubility permitted more concentrated electrolytes and more rapid plating. In the issue of May 8, 1915, we pointed out the advantages which cobalt might possess as a substitute for nickel in this work, and among them was the more rapid rate of deposition possible with that metal.

At the recent convention of the American Electrochemical Society two papers were presented dealing with the best conditions for electroplating with nickel, and one of them had to do principally with the rate of deposit. It was shown that the use of a hot solution permitted an increase of two fold or three fold in the current-density used. At the same time the resistance of the electrolyte is decreased and the actual deposit brought closer to that computed from the electrochemical equivalent. The deposit produced is tougher than one obtained in a cold solution, and is less likely to peel off, a fault all too frequent in commercial nickel-plating.

Commercial nickel plating usually contains several per cent of iron, which is evidenced by a dark color. This may be avoided, and the bath kept in better condition, by the use of purer nickel anodes. Such anodes cost no more than the 95-per-cent alloy commonly used. Defects in the deposit may be avoided by surrounding the anodes with bags, since loosened solid particles from the anodes frequently cause pitting when they come in contact with the cathodes.

Greater care in the working with nickel and greater speed in its deposit, as here shown to be possible, will help to prevent it from being displaced by cobalt or some other substitute in commercial work. Nickel is cheaper than cobalt, but requires more power, and to hold its place must be able to show at least equal facility in operation and equally good results.

Happenings in the Industry

Conference Between Engineers and Bureau of Standards at Atlanta on Proposed National Electrical Safety Code—Notable Flood-Lighting of a Columbus Department Store—Electrical Exports for February Establish a New Record—Summer Program for University of Wisconsin—Miscellaneous News Notes

Conference Between Engineers and Bureau of Standards at Atlanta.

The affiliated technical societies of Atlanta, Ga., arranged a conference in that city with the Bureau of Standards, which took place on May 2, 3 and 4. The meeting was opened at 10:00 a. m., on May 2 by Allen M. Schoen, of Atlanta, acting at chairman, who stated that the conference was primarily intended to give the engineers of the South an opportunity to present their views on the proposed National Electrical Safety Code, which had been prepared by the Bureau of Standards. He introduced E. B. Rosa, chief physicist of the bureau.

Dr. Rosa stated that the bureau had become interested in the National Electrical Safety Code by being requested by operating electrical companies to assist in reducing the large number of preventable accidents. An appropriation was made for a study of the subject, which should take practical conditions into consideration. The National Electric Light Association appointed a safety committee to work with the bureau. After making a collection of the safety rules already in existence, it was decided that the bureau should prepare a National Safety Code. A tentative code was prepared and discussed with the representatives of the various organizations of light and power, telephone, telegraph and railway companies, and also some of the labor unions. It did not prove an easy task to prepare a code which would meet the views of all these interests, but after detailed criticism by them, a final conference was organized by the Bureau of Standards, at which a very careful study of the proposed code was made by committees of the conference. The code was then printed, but several questions were left unsettled. These are being studied by the Bureau of Standards and will be published as appendices to the code.

It is expected that when the code is printed it will be adopted tentatively by the operating companies and also made a part of the official rules of public service commissions or municipalities, and the fact that it was prepared by an entirely disinterested body will facilitate its adoption. It is hoped that it will not be legislated into effect, since that would make it difficult to revise it as may become necessary. The bureau intends to follow it up, noting the difficulties in carrying it out, and invites criticism at all times.

The code proposed consists of four parts, dealing respectively with electric supply stations, overhead and underground lines, utilization equipment, and electrical operation. It goes into great detail as to methods of construction and operation. The code was read and discussion invited.

The discussion brought out several features which had been misunderstood, but no radical changes were suggested. It was explained that the provisions covering construction were expected to apply only to future work, except where existing plants could be modified at reasonable expense. The rules could be waived by proper authority whenever the expense appeared to be excessive.

The provision for the use of medium hard-drawn copper provoked much discussion, as the engineers did not seem entirely familiar with its properties. W. J. Canada, of the Bureau of Standards, explained that the companies themselves were adopting it, on account of its greater stability and the possibility of avoiding excessive sags. He pointed out that the soft copper really became medium hard after being weathered some time, and the slack pulled up, and it was more economical to start with medium copper, which cost no more than soft, and would be kept in stock by manufacturers when generally used. The question of joints in medium copper was discussed, and tests made by the bureau were explained. Attention was called to the fact that there was a difference between the melting temperature of solder and the annealing point of copper, and if soldering was done at temperatures between these limits, a safe joint could be obtained.

The amount of sag specified for overhead construction were criticised as excessive. Mr. Canada explained that an economic balance had been figured, taking into consideration the strength and cost of supports, and the amount of separation, and also the interest of the public, which demands a reasonable clearance.

Mr. Schoen suggested that a rule be included to prohibit high-tension lines crossing over buildings, or being within 25 feet of a building. The engineers present felt that such a rule could not be enforced in all cases, but this practice was now avoided when possible.

After the close of the day's session the members were taken to one of the substations of the Georgia Railway & Power Company, where they witnessed a demonstration of the methods of replacing defective insulators in working high-tension lines, whose potential was 110,000 volts. The methods employed permitted this to be done with absolute safety.

Night Session.

At the evening session Dr. Rosa lectured on the work of the Bureau of Standards to an audience composed of the members of the conference and a number of invited guests. He traced the history of its development from a mere Bureau of Weights and Measures to its present position, which is similar to that of the research department of a great national university. He described the operations of the various departments of the bureau in detail, illustrating his remarks with a number of motion pictures. The audience was much impressed with the wide scope of activities of the bureau, which included the testing of nearly all the materials of construction used by the government, from paper to cement and steel, and all of the instruments used in the industries, as well as by the federal departments. Some of the more recent developments were departments for testing radioactivity of radium salts, and for the standardizing wireless apparatus.

Dr. Rosa pointed out in conclusion that this was the only branch of the Federal Government provided to assist the manufacturers of the United States, whose annual product amounts to twenty-one billion dollars, and that the annual appropriation for its maintenance was only $600,000. The Department of Agriculture receives an appropriation of twenty-five millions, while the value of our farm products totals but nine billions. He suggested therefore, that the American people should assist with their influence to obtain further appropriations for the work of the bureau.

Electrolysis.

The session of May 3 was devoted to a study of methods of mitigation of electrolysis. Dr. Rosa explained that the Bureau of Standards had received many requests for information on this subject, and had made very detailed studies, beginning with the effects of corrosion of iron in soils, then investigating earth resistance, the protection obtained from various paints and coverings, prevention of leakage from rails, manner of making rail bonds, and the methods of making electrolysis surveys. Field studies were then made on practical problems at St. Louis, Mo., Elyria, O., Springfield, O., and Springfield, Mass., at the request of the public service corporations. In all cases the companies affected accepted and carried out the recommendations of the bureau. Detailed reports of all these studies have been published.

Burton McCollum, of the Bureau of Standards, then read a paper on "The Mitigation of Electrolysis." He described electrolysis and called attention to the fact that electrolysis was frequently charged with the effects of self-corrosion. He also outlined the conditions under which electrolysis may occur, and the damage and dangerous conditions in underground pipe or cable systems which may result therefrom. Many methods of mitigation have been proposed, which may be divided into two classes:

(1) Methods which seek to remove the effects without reference to the cause.

(2) Methods of preventing leakage.

In the first class are included many coverings and paints, none of which were found useful. The results of tests of these are to be found in the publications of the Bureau.

Pipe-drainage systems have been used extensively, but are very expensive under severe conditions, and where more than one underground system exists, they merely transfer the danger to another system, as one is improved. For cable systems this method is of considerable value, but there is always a possibility that some dangerous places may be overlooked.

The second class is applicable to the railway return-feeder systems, with a view of reducing the amount of fall of potential in the negative return, and consequently the leakage to pipes. The proper number and location of power houses is the first consideration. Next the track conditions and bonding must be investigated. The use of the Nicholls joint (using melted zinc) and cross-bonding have been found very effective. If electrolysis continues after these items have been properly adjusted, further improvements may be obtained by a system of properly designed negative feeders. These may be arranged with resistance in the shorter ones, so that a uniform and reasonable potential-gradient is obtained.

Where traffic conditions are heavy, good results may be obtained with a three-wire system, alternate sections of overhead feeders being made positive and negative, while the track is neutral. This system has been found very satisfactory abroad.

Concluding, the speaker recommended that a careful survey of each particular case should be made, having reference to all the systems involved, and then applying one or all of the methods in class 2. Sometimes a limited amount of pipe drainage or insulating joints as an auxiliary remedy may be advisable. It has been found that the operating economies obtained by the use of these methods will pay all or a large part of the annual charges on the additional investment in copper.

The paper was highly commended by those present, as providing a basis for co-operation of the interests involved. E. M. Miller, of the American Telephone & Telegraph Company, George J. Yundt, of the Southern Bell Telephone & Telegraph Company, and A. F. Ganz, of the Stevens Institute of Technology, spoke at length, endorsing the proposed methods, and giving examples of practical cases bearing on the subject.

The general discussion which followed brought out various practical details. The difference between an insulating joint and a high-resistance joint in a pipe was shown to be important. An effort was made to decide as to a safe limit for the potential differences between pipes and tracks, but it was explained that no limit could be set, and the amount of current flow was the important factor, a large current with very small potential difference being dangerous. Reversing the polarity of the power plant was shown to be useful only as a very temporary expedient, in special cases, since the dangerous conditions are merely transferred to other parts of the system.

As a result of this paper and discussion, it is probable that in the future satisfactory co-operation between the railway companies and the owners of underground properties may be expected.

Grounding.

The session of May 4 was devoted to the subject of grounding of electrical conductors, rules for which are to be made a part of the proposed National Safety Code. Dr. Rosa explained that a ground connection is a safety device intended to keep the difference of potential between electrical conductors and the earth within reasonably safe limits, for the protection of life and property. It must be of low resistance, and permanent, and the studies made by the Bureau of Standards were for the purpose of obtaining these conditions.

Mr. McCollum read a paper showing the necessity for such grounds, with especial reference to their application to secondary distribution systems fed by high-tension alternating currents. He showed that dangerous conditions arose principally through the breaking down of transformers, and from crosses between primary and secondary wires. The grounds not only reduced the possible potential difference between secondary conductors and the earth, but also assisted the operation of circuit-breakers. Investigations of methods of obtaining grounds proved that water pipes are most effective, and that driven pipes should be used where no water pipes are available. The objections to the use of water pipes by the owners are based chiefly on the danger from electrolysis, which is negligible with alternating currents, but the ground connections should be limited to a single system of pipes, which should be continuous. The approved methods of making grounds were described in detail.

It was recommended that the practice of connecting low-tension, alternating-current secondaries to water pipes be made universal, and that the periodical inspection and resistance measurements of grounds be provided for.

Mr. Canada then read the rules and specifications for grounding proposed in the National Safety Code. The subject was then discussed in detail, the principal criticism being that the specifications for making grounds were not rigid enough, though in some cases the sizes of ground wire proposed were too large. It was explained that the code was intended for universal application, and that in some localities more rigid specifications could not be followed. It was expected that the proposed code should be the minimum of safety provision for all the operating companies, and further, that it should agree with the requirements of the fire underwriters, who were adjusting their rules to conform to the proposed National Code.

After the discussion, the representatives of the operating companies accepted all of the recommendations of the Bureau on the subject, and promised their co-operation in carrying them out.

Resolutions were passed, commending the Bureau of Standards for its interest and assistance in the practical problems which had been discussed.

Among those present, who took an active part in the discussions, were, besides those named in the foregoing: H. C. Sutton, representing Charleston Consolidated Railway, Light & Power Company; G. K. Selden, Southern Bell Telephone Company, Atlanta, Ga.; H. L. Cornelison, superintendent of Municipal Lighting Plant, Jacksonville, Fla.; E. P. Peck, Georgia Railway & Power Company, Atlanta, Ga.; P. A. Tillery, Carolina Railway, Light & Power Company, Raleigh, N. C.; H. S. Badger, Nashville Railway & Light Company, Nashville, Tenn.; W. G. Clayton, American Railways Company, Roanoke, Va.; H. R. Palmer, Virginia Railway & Power Company, Norfolk, Va.; K. L. Wilkinson, American Telephone & Telegraph Company, New York; E. J. Nash, Butte Electric Railway, Butte, Mont.; J. C. Stevens, Virginia Railway & Power Company, Norfolk, Va.; S. T. Cummings, Albama Power Company, Birmingham, Ala., and Mr. Strong, Louisiana Fire Prevention Bureau, New Orleans, La.

Notable Flood-Lighting Installation in Columbus.

The first building in Columbus, O., to be permanently flood-lighted is equipped with a unique installation, in that the lamps and projectors are all located on the premises, making the lighting entirely independent of any other location. Of the 20 units used, 16 are concealed in the marquee, which projects the width of the sidewalk, just above the first story. The Z. L. White Company has just completed the building for its department store, at a cost of nearly $500,000. Of rather massive construction, with front of white marble and terra cotta, it is well adapted to this form of illumination. Situated at the outer edge of the marquee, the units throw an egg-shaped ray at an angle of about 70 degrees. This is helped out at the top

Flood Lighting of a Columbus Department Store.

of the building by four additional units concealed in the belt cornice at the base of the eighth floor, one unit at each pilaster. A bright and uniform effect is thus secured over the whole illuminated field. At the same time the interior of the building is free from the glare that would result if the rays were thrown upon it direct from across the street. Work can be carried on after night without inconvenience on any or all floors.

Absolute safety has been secured against the lighting construction being torn loose by wind. The projectors not sunk in the marquee are secured to the steel window frames. The installation was effected without disturbing the terra cotta. Over a million candlepower is thrown upon the face of the building, causing it to stand out with great attractiveness from any point within range of vision. Projectors of X-Ray make, with 250-watt lamps, stereopticon type C, form the installation.

The cost of the installation was $300, and the energy cost, on a schedule of five hours a day, amounts to $15 a month. An inducement which led the owners of the building to adopt this system of lighting was that it would emphasize at night the company's name of "White," in the sense that the light material of the building does in daytime.

Electrical Exports for February.

The monthly summary of the foreign commerce of the United States for last February, which has just been issued by the Bureau of Foreign and Domestic Commerce, Washington, D. C., makes the interesting disclosure that the electrical exports for that month have established a new record. The previous record of last November has been exceeded by nearly $168,000. An increase of over $1,259,000 occurred as compared with February of a year ago.

For the four electrical classes for which numbers of articles exported are given in the official reports, there were shipped in February the following: Electric fans, 1,872; arc lamps, 112; carbon-filament lamps, 86,471; metal-filament lamps, 580,667.

In the following table are given the detailed figures for last February and for the corresponding month of a year ago.

Articles.	Feb., 1916.	Feb., 1915.
Batteries	$ 104,712	$ 109,214
Dynamos or generators	112,965	127,565
Fans	30,637	10,206
Insulated wire and cable	217,764	95,641
Interior wiring supplies, etc. (including fixtures)	133,500	67,648
Lamps—		
Arc	1,761	8,031
Carbon-filament	12,898	9,862
Metal-filament	107,715	51,373
Meters and other measuring instruments	59,170	22,807
Motors	439,769	326,224
Telegraph instruments (including wireless apparatus)	2,542	5,589
Telephones	105,176	101,957
Transformers	86,414	46,646
All other	1,527,588	700,804
Total	$2,942,611	$1,683,567

In February there were also shipped 19 electric locomotives, valued at $134,405; these are not included in the above table.

For the eight months ended February 29, 1916, the total value of electrical exports was $18,581,180; for the corresponding period ended February 28, 1915, the total was $12,205,421; for the corresponding eight months of 1913-1914, it was $17,723,804.

University of Wisconsin College of Engineering Announces Summer Session.

The eighteenth annual summer session of the college of engineering of the University of Wisconsin will be held at Madison during the six weeks' period beginning June 26. Special courses will be given in chemistry, electrical, steam and hydraulic engineering, gas engines, machine design, mechanical drawing, mechanics, shopwork and surveying. All courses given in the University summer session are open to engineering students. For information address F. E. Turneaure, Dean, Madison, Wis.

Miscellaneous NEWS NOTES

Tacoma to Effect Economy by Combining City Departments.—If plans of the City Council are put into operation the city of Tacoma will save between $30,000 and $50,000 per year by placing the municipal light and water departments as part of the engineering department, with the city engineer in charge.

Montana Town to Revert to Candles.—Malta, Mont., with a population of more than 1,000 people, may be compelled to resort to the use of candles and kerosene lamps. The Malta Electric Company, which has furnished electric service in the town, will retire from business. The company made application for a franchise, but it was not granted, and the City Council also declined to purchase the plant.

Electric Vehicle Boosting Committee Formed.—Chairman W. H. Johnson, of the Electric Vehicle Section of the National Electric Light Association, has appointed a committee for the purpose of making the electric vehicle prominent at the coming Chicago convention. As this will be the first N. E. L. A. convention in which the Electric Vehicle Section will participate, the committee will take the opportunity of impressing on the other members of the Association the value of the electric vehicle and this method of transportation.

Cincinnati Electric Show Dates Announced.—The electric show committee of the Cincinnati Chamber of Commerce has set dates for the 1916 electric show, the event of last fall having been so successful the show has been made an annual affair. November 18 to 25 are the 1916 dates, and Music Hall, where the 1915 show was held, has been reserved in entirety for the display. With so much time in which to arrange for the various details of the show and to enlist the interest of prospective exhibitors, it is anticipated that it will be even more comprehensive and interesting that that of last year.

New Orleans Holds Very Successful Electric Show.—The first New Orleans Electric Show was held during the week of April 24-29 under the auspices of the New Orleans Jovian League. The show occupied the entire second floor of the Hippodrome Building, and besides the many exhibits there were many amusement features and special events on the program. A representation of an electrically operated steel barge was given. The attendance during the week was 10,000 people, and Chairman W. E. Clement of the executive committee reports the show a big success.

Preparedness Lecture on the Flying Machine to Be Given in New York.—The fifth of a series of lectures on preparedness will be given before the New York Electrical Society on May 18 at the Engineering Societies Building, 29 West Thirty-ninth Street, New York City, by Henry Woodhouse, managing editor of *Fly*, on "The Flying Machine in War and in Peace." Besides outlining recent development in aviation, Mr. Woodhouse will indicate what this country must do if it is to have adequate preparedness and will discuss the impression now rapidly growing in Europe that the war will be decided in the air. The lecture will be graphically illustrated by a unique series of slides.

Large Power Units Are Described.—At a meeting of the American Society of Mechanical Engineers, held in the Engineering Societies Building, 29 West Thirty-ninth Street, New York City, May 9, H. G. Stott, superintendent of motive power of the Interborough Rapid Transit Company and of the New York Railways Company, and W. S. Finlay, also with the Interborough Company, discussed the large steam turbine and described in particular the three 30,000-kilowatt steam turbines installed at the Seventy-fourth Street Power Station of the Interborough company. With the aid of slides they showed the mechanical features of these high-capacity, comparatively small-sized power producers and gave figures on their coal and steam consumption and efficiency.

Tungsten Being Mined in Connecticut.—A tungsten mine is being successfuly worked in Trumbull, Fairfield County, Conn., it is reported. Attention was first called to the deposit in 1895, when scheelite was the mineral mined. Later the property was acquired by the American Mining & Tungsten Company and tungsten and wolfram were taken out. At the present time the owner is the American Electric Equipment Company, and it is said $2,000 to $4,000 worth of tungsten is being mined daily.

Electrical Operation of Large Draw Bridge.—At a meeting of the Western Society of Engineers held in Chicago on May 8, a paper entitled "The Operating Machinery of the Willamette River Draw Bridge, Near Portland, Oregon," was presented by Byron B. Carter. This bridge has a span of 521 feet and is operated entirely by electric power. The machinery and method of operation were described, also certain improvements therein that were suggested by extended experience.

Lighting Contract for Massachusetts Company.—The Greenfield (Mass.) Electric Light & Power Company has contracted with the Deerfield River Electric Light Company, Conway, Mass., to supply electricity and to rebuild and extend the local lines at a cost of about $25,000. A number of 100-candlepower street lights will be installed. Heretofore the local company has bought its energy from the Conway Street Railway Company, which finds it needs all the energy available.

Mount Wilson Solar Observatory Described.—Dr. Arthur S. King, superintendent of the physical laboratory of the Mount Wilson Observatory, was the principal speaker at the luncheon of the Los Angeles Jovian League held May 3. His subject was "The Equipment and Method of Work at the Mount Wilson Solar Observatory." He described the new 100-inch telescope now under construction. This telescope, the largest instrument in the world, has moving parts which weigh 100 tons, the lense alone weighing five tons. He described the many ingenious electrical devices used in connection with the various instruments, and stated that 50 and 25-horsepower units with remote control were used in connection with the telescopes.

New Haven Power Plant Supplies Factories.—The Housatonic Power Company, operating hydroelectric plants in Connecticut, is controlled by the New York, New Haven & Hartford Railroad Company. The Massachusetts Public Service Commission, in its general recommendation for the divorcing of utilities, not strictly railroad in character, from the New Haven company, urges that the holdings in the Housatonic company be disposed of. The railroad, however, opposes the measure, pointing out that the properties of the hydroelectric company would be adversely affected by their separation from the New Haven system, which utilizes the power for operating its trains. The peak load occurs before and after factory hours, and the surplus energy generated is sold to manufacturing plants in the neighborhood.

Newark to Hold Industrial Exposition.—An anniversary industrial exposition will be held in Newark, N. J., during the week starting May 13 and which promises to be the largest industrial exposition ever held in this country in which the manufactured products of a single community make up the exhibits. Among the exhibitors will be the Crocker-Wheeler Company, the Edison Lamp Works of the General Electric Company, the Westinghouse Electric & Manufacturing Company, the Star Fan & Motor Works, the Splitdorf Electrical Company, the I. R. Nelson Electrical Repairing & Manufacturing Company, the Public Service Electric Company, Ludlow & Squire and Gould & Eberhardt. Many of the exhibits will be of an educational nature and will make their appeal to the public through this medium. Special attention will be given at the exposition to the industrial preparedness movement.

Electricity in Cotton-Goods Manufacture

A Description of the Processes Involved in the Manufacture of Cotton Goods from the Raw Cotton to the Woven Goods

Industrial Power Series—Article No. 164.

There is probably no industry where electric motor drive has been adopted to a greater extent than in the manufacture of cotton products. The transition has been gradual, starting from the change from central steam or water-power plants to large motors, then to group and later to individual drive. The cotton industry is standardized to a large extent, with practically uniform prices for the finished product. It is, therefore, apparent that mills with the most modern equipment and the greatest production per unit of equipment are in a position to make larger profits than the mills with antiquated power facilities. The overhead charges remain the same whether the machines are turning out 75 per cent, 90 per cent or 100 per cent of their rated capacity, and the nearer the maximum is reached the more economical the operation of the mill. Electric drive has done much to bring production up to the maximum, largely owing to the uniformity and higher speeds obtained, both of which also improve the quality of the product.

Where electric drive is used the location of the machines and buildings is independent of the power supply and additions to the buildings and the power equipment can be easily made. It frequently happens that the work in hand makes it desirable to operate a portion of the mills overtime and this can be done profitably where central-station service and electric drive are used. With mechanical drive from a central source of power, there is a large friction loss and speed variation, as it is impossible to prevent the whipping of shafting where great lengths are used. Where individual drive for the machines is used it is possible to check accurately the exact power requirements and thus keep an accurate record of power costs. Although the cost of power is but a small percentage of the cost of production, the increase in output where electric drive is used introduces a factor of unusual importance. In some instances production has been increased 5 per cent by using motor drive.

Process of Manufacture.

This article is intended to outline the preliminary processes and to describe the principal machines used in the manufacture of cotton. Cellulose is the principal component of cotton and in this it is in common with all other vegetable fibers. A small amount of oily and waxy matter is, however, associated with the cellulose when cotton is in the natural condition, which appears on the sur-

Interior of a Cotton Mill Showing Four-Frame Motor Drive.

Group of Motor-Driven Looms.

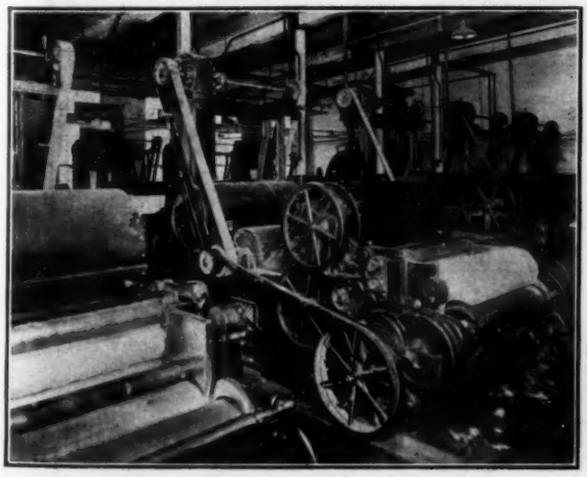
Motor-Driven Slubbers.

face of the fiber and it is thought to act as a protective layer. It is difficult to impregnate the raw fiber with solutions, as the coating of the waxy material causes it to be water repellent. Before dyeing or bleaching, cotton must be boiled out which is accomplished by boiling in a solution of dilute caustic soda, soda ash, soap, or other alkailine solutions. Cotton wax can also be removed by the use of certain oils. The fact is that the wax makes the fiber more coherent and plastic which aids materially in the spinning of the cotton, and from this it will be seen that bleached cotton and dyed cotton are not spun so satisfactorily as the raw cotton.

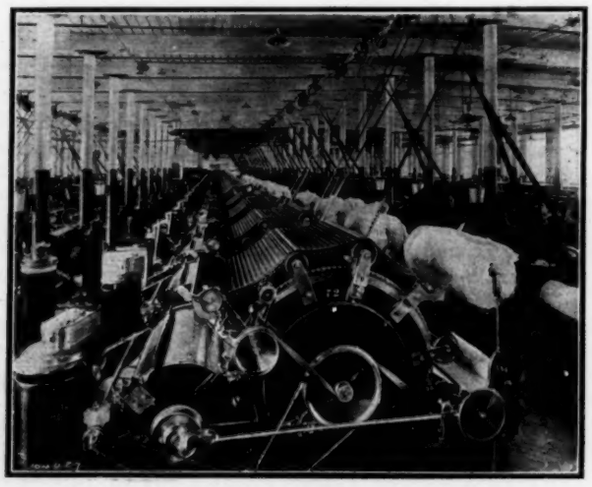
To fit cotton for manufacturing purposes scouring is not necessary as there is but a small amount of impurities in the raw fiber. The waxy coating must be removed, however, before dyeing, in order that it may absorb the dyes. Cotton may be bleached in any form of its manufacture and it is occasionally bleached in its loose state before spinning, by means of special machines. It is essential that the liquor be circulated thoroughly through the goods in the boiling-out process, which is best accomplished in a bleaching machine where it may be automatically worked in the solution. From three-quarters of an hour to an hour is the usual time required for the bleaching liquor treatment. Another process of bleaching which may be used with skein yarns, is to link the skeins together in the form of a long chain and run it continuously through squeeze rollers. There are also special machines for the bleaching of cotton slubbing and yarn in the form of cops and tubes, the yarn or slubbing being wound on perforated tubes and so arranged on the machine that the bleaching liquors are forced through the cotton either by means of vacuum suction or pumps.

The principal method of bleaching cotton is in the shape of cloth and the form this bleaching takes depends upon the use for which the cloth is intended. Market bleach is used when the cloth is to be sold as white muslin, and Turkey red or bottom bleach is given when the cloth is to be dyed. Madder bleach is given if the cloth is to be printed. When the cotton pieces come from the loom they are stitched together and marked for further identification. Then to burn off the loose fibers and lint from the surface of the cloth it is singed by passing rapidly over a series of gas flames or passed over curved plates heated to redness, or over a revolving copper roller that is kept at a high temperature. The goods next go through a process known as boiling out similar to the process used for cotton yarn and then thoroughly washed to remove the solutions previously used.

Having passed briefly over the bleaching process the various manufacturing processes next demand attention. Mixing the cotton is the first process after it has been received at the mill. This is for the purpose of allowing the cotton to assume its normal condition, and to establish an average quality of grade in the lot. A machine known as a bale breaker is sometimes used for mixing cotton. Its object is to separate the matted masses of cotton as they come from the bale and to deliver the cotton in an open state to the mixing bins. The principle of the bale breaker is three or four pairs of rolls, each



Individual Motor Drive in Picker Room.



Motor-Driven Cards in Cotton Mill.

revolving at a higher rate of speed than the preceding pair. The cotton fed to the pair that is revolving at slow speed, is pulled apart when it comes under the action of the pair revolving at a higher speed. The room containing the machinery through which the cotton passes during its first stages of manufacture is known as the picker room, and its equipment for medium counts generally consists of an automatic feeder, opener, breaker picker, intermediate picker, and finishing picker.

Where the bale breaker is used, that also may be found in this room, although it is usually in the mixing room. Other machines in some cases may also be found in this room, such as waste openers and waste breakers. In the mills using long-stapled cotton and producing fine yarns, either the intermediate, or the intermediate and finisher pickers would be omitted from this list in order to lessen the beating action. In large mills, usually two rooms at least are devoted to the mixing and picking, the mixing, feeding and opening being generally carried on in one room, while the intermediate breaker, intermediate and finishing pickers are located in another room. The usual procedure is to open the cotton on the first floor and then feed it to the automatic feeder from which it passes to the opener and then to the breaker picker located on the second floor. From the breaker picker the cotton passes to the intermediate picker, while the finishing picker takes the cotton from the latter. Where a bale breaker is used it is usually located in the opening room and aprons are so arranged that the cotton is carried from the bale breaker to the mixing bins situated in such a position behind the automatic feeders that the cotton can be conveniently handled.

Automatic feeders are used for the purpose of feeding other machines and receive the cotton after it has been mixed. Larger quantities of cotton than are actually required are carried away from the mass by an apron with projecting spikes and the supply to the next machine is limited to the actual requirements. Openers are not used in all mills as the breaker picker and automatic feeder are connected directly to the breaker picker. Eliminating heavy impurities from the cotton, and disintegrating the cotton into small tufts are the objects of the opener. A beater that has a speed of from 1,200 to 1,800 revolutions per minute and having two blades, delivers two blows for each revolution to a fringe of cotton which knocks any foreign substance through grid bars. The tufts of cotton will also be removed from the fringe as soon as they are released from the bite of the feed rolls and will be light enough to be carried to the next machine by an air current.

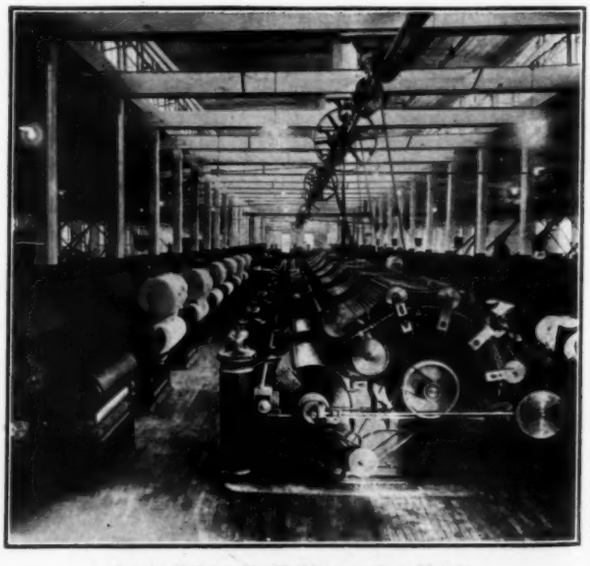
By means of an air current the cotton from the opener is carried to the next machine by what is known as a trunk. A fan exhausts the air from the trunk which draws the cotton from the opener. A circular tube of sheet metal, from 10 to 13 inches in diameter, constitutes a plain conducting trunk. Wood construction is also used for horizontal cleaning trunks and are provided with doors for removing the dirt accumulation, also grids which allow the dirt to drop through them. The same general construction is used for inclined cleaning trunks, the only difference being that the latter are constructed in an inclined position. After the cotton leaves the opener it is transferred to a breaker picker either by an automatic feeder or by a trunk. Breaker pickers have for their object the removal of foreign matter, separating the tufts of cotton to obtain easier manipulation, and to wind the cotton on a roll of cylindrical form in a layer, the resultant being known as a lap.

To secure a lap of more uniform weight per yard the intermediate and finishing pickers are used and are similar in construction to the breaker picker. The lap of cotton as it leaves the picker consists of cotton fibers crossed in all directions, together with a small amount of foreign matter. Machinery of an entirely different character to that described is necessary to remove this foreign matter which is done by the cotton card and the process is called carding. The carding process is employed in all cotton mills. Disintegrating the cotton, removal of the smaller and lighter impurities, and changing the form of the cotton from a lap to a sliver are the principal objects of the card machine. The sliver consists of a loose strand of cotton, round in section, which after the carding, drawing and combing process is generally coiled in a can. For new cotton mills the card in common use is called the revolving-top flat card and sometimes known as the English card.

One of the most important features in the production of good yarn by paralleling and attenuating machinery is accomplished on the drawing rolls. There are two kinds of drawing rolls, common and metallic, placed one above the other in pairs, the lower ones being driven positively by means of gears and the upper ones by friction when common.

Combing and incidental processes are customary for fine yarns, high-grade yarns or even for coarse yarns. Picking and carding processes are generally considered sufficient for the purpose of cleaning the fiber for yarns of the lower qualities. Short fibers should be removed from the stock in the manufacture of fine yarns which is accomplished by the combing process. Three kinds of machines generally compose a combing equipment, the sliver-lap machine for making a lap from a number of card slivers; the ribbon lap machine for combing several laps from the sliver lap machine into a firm and even lap, and the comber which has already been mentioned. The combing equipment generally consists of drawing frames, sliver-lap machines and combers when the drawing frame is used. The latter machines have for their objects, reducing the thickness of the sliver, evening the product, twisting the roving and winding the latter on a bobbin.

Spinning is the next operation as the roving produced



Cards Driven by 75-Horsepower Motor.

by the fly frame used in the previous process is in a condition suitable to be converted into yarn. Four kinds of spinning machines are used for the production of cotton yarn, the ring frame, the throtle frame, self-acting mule, and the so-called hand mule. The use of spinning machinery accomplishes several objects; it completes the roving of the yarn to form a thread or yarn, gives the yarn

required strength by twisting, and winds or builds the yarn into suitable form for the following process.

Three principal operations are preformed by the mule, including the reduction of the roving, giving the yarn sufficient strength by twisting it, and winding the yarn into a suitable form for transportation or for use in the next process. Next in order comes twisting machinery of various types, the selection depending upon the condition of the yarn and method of twisting.

Spooling follows next, but has no effect upon the stock in its manufacture, the principal object being to put the yarn into assembled shape suitable for the next process. In most cases the yarn goes to the spooler from the spinning frame. One important feature of the ordinary method of cotton warp preparation is warping which follows the spooling. The object of the warper is to unwind the yarn from a large number of spools and place it suitably in an even sheet for future operations. The slasher treats the warp yarn as it comes from the warper and coats each thread of warp with a size which is followed by drying. The desired number of threads are then run on a loom beam in an even manner so that they will unwind without obstruction in the loom.

Where yarn mills produce warps for sale, and in those mills where yarn is both spun and woven, but where it is the practice to bleach, dye, print, or otherwise treat the warp yarn, an entirely different system of making warps is generally used, known as chain warping. A large number of ends of yarn, either single or ply, gathered together so as to form a loose, untwisted rope of yarn of considerable length, constitutes a chain. In this form the yarn is in better shape for transportation, bleaching, dyeing, etc. Chains may be packed in bags or they may be balled or linked. Chains are generally put through a process that changes the appearance of the yarn depending upon the kind of treatment. The next process depends on whether the chain is a short chain or a long chain and whether it is to be used for warp or filling. In the case of warp yarn in a short chain the process following converting is dressing, or beaming to the loom beam; warp yarn in a long chain is dressed or beamed on the section beam. For filling yarn the next process is quilling, which is the last process of the long chain system for filling yarns in which the yarn forming the chain is wound on filling bobbins, or quills ready for the shuttle.

POWER DATA FOR COTTON MACHINERY.

Application	Horsepower
Braher cotton picker	10
Cotton carding machine	20
Small cotton carding machine	2
Finishing picker	15
Cotton washer	7.5
Cotton tumbling barrel	2
Cotton dryer	20

Average load-factor for group drive, 62.4 per cent. Average kilowatt-hours per month per horsepower, 162.2. Load-factor here signifies the ratio of the actual energy used in kilowatt-hours to the maximum kilowatt-hours which would be used were the motors to run at full load for 350 hours a month.

Examination to Be Held for Investigation Agent.

An examination will be held in various cities of the United States May 19 by the Bureau of Foreign and Domestic Commerce, Washington, D. C., for a special agent to investigate the market for electrical goods in China, India, East Indies, Africa and Australasia. The examination will consist of practical questions on the subject of investigation, thesis on investigation methods and a statement of the candidate's knowledge and experience. Applicants must be male citizens of the United States, have good address and appearance and be able to address public gatherings. The salary will not exceed $10 per day, and transportation and living expenses (the latter not to exceed $5 per day) will be paid. Applications should be made directly to the Bureau with a statement of applicant's education and experience in investigation work and an unmounted photograph taken within two years preceding application.

Regulation of Telephone Utilities in Utah.

The first step toward the regulation of public utility corporations in the state of Utah has been taken by the Board of County Commissioners of Salt Lake County, within which county Utah's chief city is located. The Commission has enacted an ordinance providing that all charges for telephone service shall be just and reasonable and every unjust or unreasonable charge made shall be prohibited and declared unlawful. Service, equipment, and facilities shall be furnished by every telephone company to promote the safety, health, comfort and convenience of its patrons, employees and the public. Every telephone company operating within the county must file with the board of county commissioners within 60 days of its passage, a schedule of all rates together with all rules and regulations pertaining to rates. The rules and regulations made by any telephone company must be just and fair.

The passage of this ordinance is the outcome of a controversy between the Mountain States Telephone & Telegraph Company and its patrons over the matter of toll charges between exchanges, in Salt Lake County.

It will be noted that the ordinance above referred to applies only to telephone companies as it is not the intention of the commissioners at the present time to regulate the charges and service of other public utilities within the county, no objection having been made by their patrons as to either.

Life-Testing of Incandescent Lamps at Bureau of Standards.

The lamps purchased by the Federal Government, amounting to about 1,250,000 annually, are inspected and tested by the Bureau of Standards, Washington, D. C. The specifications under which these lamps are tested are published by the bureau and are recognized as standard by the manufacturers as well as by the government. They are used also by many other purchasers of lamps.

The lamps are first inspected for mechanical and physical defects, this being done at the factory by bureau inspectors. Representative samples are selected and sent to the bureau where they are burned on life-test at a specified efficiency at which they must give a certain number of hours life, depending upon the kind of lamp. About 5,000 lamps are thus burned on test each year.

For this test great care must be taken in the measurement of the lamps and in the adjustment and regulation of the life-test voltage.

Scientific Paper No. 265, just issued by the bureau, gives a complete description of the special apparatus and of the methods used in these inspections and tests. Copies of the publication may be obtained free upon application to the Bureau of Standards, Washington, D. C.

Practice of Boston Company in Lamp Trimming.

Boston Edison Company practice with respect to the care of street lights was set forth in a memorandum presented to the Electric Light Commissioners at a recent hearing on the Boston street-lighting contract, as follows:

All arc-lamp trimmers are provided with one-horse teams and trim an average of 95 lamps per day, ranging from 70 to a maximum of 100. Arc-lamp patrolmen in the heart of the city travel on foot, covering about 600 lamps. All lights are seen every night, the more important ones twice or thrice.

Outside the city proper, horse or automobile transportation is used, and the patrolmen cover 800 to 1,200 lamps, seeing each lamp at least every other night and many lamps nightly.

Final Plans for N. E. L. A. Chicago Convention

Condensed Program of Sections and Further Particulars Regarding Entertainment Features of Big Meeting

Subject to some possible slight changes, the program of events—work and play—for the annual convention of the National Electric Light Association, to be held in the Auditorium and Congress Hotels, Chicago, on May 22 to 26, inclusive, is as follows:

Monday, May 22, 1916.

Arrival of special trains, which will be met by members of the Chicago Convention Committee, with automobiles.

Registration at convention headquarters, second floor foyer, Auditorium Theater, Congress Street near Wabash Avenue.

9:00 P. M.—Formal presidential reception in Gold Room, Congress Hotel (Michigan Boulevard and Congress Street), followed by dancing in Elizabethan Room, Congress Hotel. Music by two orchestras.

Tuesday, May 23.

10:00 A. M.—First General Session.

Noon.—Automobile drive through parks and boulevards for out-of-town visiting ladies. The party will take luncheon at the South Shore Country Club, which overlooks Lake Michigan at East Seventieth Street. Other entertainment will be provided.

12:30 P. M. (at conclusion of first general session)—Service-installation prize contest between three squads of linemen employed by the Commonwealth Edison Company. This contest will take place in Grant Park at the east end of Van Buren Street viaduct. While it is in progress there will be music by the full Commonwealth Edison band.

2:30 P. M.—First Technical and Hydroelectric Session.
2:30 P. M.—First Accounting Session.
2:30 P. M.—First Commercial Session.
2:30 P. M.—First Company-Section Session.
8:30 P. M.—Second General and Executive Session.

Wednesday, May 24.

10:00 A.M.—Second Accounting Session.
10:00 A. M.—Second Commercial Session.
10:00 A. M.—Third General and Executive Session.
10:00 A. M.—First Electric Vehicle Session.
2:30 P. M.—Second Technical and Hyroelectric Session.
2:30 P. M.—Third Commercial Session.
2:30 P. M.—Second Electric Vehicle Session.

5:30 P. M.—Rejuvenation of the Jovian Order at the Palais de Danse, Bismarck Garden, 817 Grace Street.

6:00 to 8:00 P. M.—Dinner for those who wish at the Bismarck Garden at $2 a plate.

7:30 P. M.—Big frolic at Bismarck Garden. This is the principal feature of the entertainment program. It is cor-

Service Installation Contest Such as Will Be Held by Commonwealth Edison Employees During N. E. L. A. Convention.

rectly described as a "Mammoth Entertainment and Carnival," with features literally "too numerous for description." The "acts" of the professional performers and the dancing of all who care to dance will continue throughout the evening. Informal dress. Performance rain or shine, as both open spaces and covered enclosures will be available.

Thursday, May 25.

10:00 A. M.—Third Technical and Hydroelectric Session.
10:00 A. M.—Third Accounting Session.
10:00 A. M.—Fourth Commercial Session.
10:00 A. M.—Third Electric Vehicle Session.
2:30 P. M.—Fourth Technical and Hydroelectric Session.
2:30 P. M.—Fifth Commercial Session—Power Sales Bureau.
2:30 P. M.—Second Company-Section Session.
3:30 P. M.—Musicale at the Blackstone Hotel for out-of-town visiting ladies. Singers and instrumentalists from the Chicago Grand Opera Company.

Friday, May 26.

10:00 A. M.—Fourth General and Executive Session. Adjournment.
10:00 A. M.—Sixth Commercial Session—Lighting Sales Bureau. Adjournment.

Convention sessions will be held in the Gold Room and the Florentine Room of the Congress Hotel and the new ball room and Masonic Room of the Auditorium Hotel. Both hotels face on Michigan Boulevard and Congress Street and are connected by a tunnel under Congress Street.

In relation to the service-installation contest of May 23, it may be noted that the test will consist in setting a transformer on a pole, making the connections, making the "service drop," fastening a bracket to a brick wall about 80 feet away representing the rear of a building, and making the connection to an outlet on the brick wall. Connected to this outlet and conspicuously placed on top of the wall will be an incandescent lamp. The first lighting of a lamp on a wall will show which gang of men did the work in the shortest time. The successful squad will receive a cash prize, and in addition a bonus for every second of elapsed time less than 15 minutes. This bonus will consist of 15 cents for the foreman and 10 cents for each man for each second under the 15 minutes. There will be three poles and three sections of brick wall.

One feature of the convention that will possess particular interest to a large proportion of the visitors will be the exhibit of the Committee on Company Sections, of which Forest J. Arnold, of the Commonwealth Edison Company, Chicago, is chairman. This exhibit will embrace publications, photographs and other material illustrating the activities of the various company sections of the National Electric Light Association. It will be found in the second tier of boxes on the north side of the Auditorium Theater.

During the convention arrangements have been made by which visitors wearing the convention badge may inspect industrial establishments and other points of interest in Chicago. No special trips have been planned, and no specific time has been set aside for the visits. In general, the establishments mentioned below will welcome delegates at any time during convention week, and will accept the convention badge as sufficient identification. The Commonwealth Edison Company will welcome visitors to its principal generating stations, typical substations, and the Edison Building, 72 West Adams Street. The Chicago Telephone Company, Peoples Gas Light & Coke Company, and Chicago Tunnel Company will also keep open house for N. E. L. A. visitors. The last named company operates the interesting electrically operated freight tunnels 40 feet beneath the surface of the streets of Chicago. The Western Electric Company will "receive" at its Hawthorne works. Elsewhere, a Pen Dell automatic substation may be inspected. The electric furnace of the Electric Steel Company, the Fashion electric automobile garage and the electrically operated ice plants of the Consumers Company and the Lincoln Ice Company may be visited. Arrangements have also been made for visiting typical electrically operated grain elevators and electrically operated draw bridges. Trips may be arranged, also, to overhead and underground electrical installations and to the Underwriters' Laboratories. Factories of the Pullman Company and the International Harvester Company may be visited as well as the manufacturing establishment of Pettibone, Mulliken & Company and the assembly plant of the Ford Motor Company. The Union Stock Yards will no doubt attract many visitors, as will, also, the great mail order house of Sears, Roebuck & Company. Visits may also be arranged to State Street department stores, prominent office buildings, and the new Municipal Pier on the North Side.

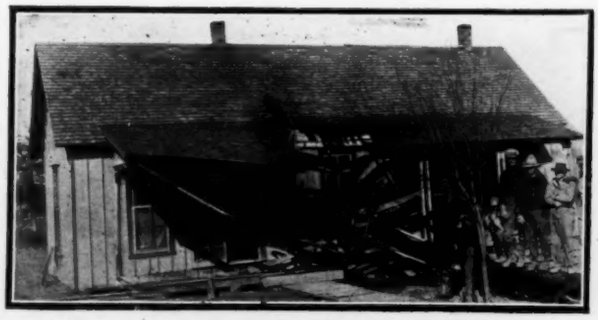
Samuel Insull is chairman of the general convention committee. Louis A. Ferguson is vice-chairman. Sub-committee chairmen are as follows: Finance, John H. Gulick; reception, Louis A. Ferguson; local industries, William L. Abbott; hotels, Ernest A. Edkins; entertainment, Homer E. Niesz; ladies' auxiliary, Mrs. Edward W. Lloyd; local registration, Oliver R. Hogue; local transportation, Gaylord A. Freeman.

Convention Dates and Series of Lectures Announced by Illuminating Engineering Society.

The tenth annual convention of the Illuminating Engineering Society will be held in Philadelphia, September 18, 19 and 20, 1916. Immediately following the convention there will be given at the University of Pennsylvania under the joint auspices of the University and the Society a course of 20 lectures on the theoretical and practical aspects of illuminating engineering. The lectures will be given by eminent authorities in the lighting world and will take approximately eight days. Detailed announcements regarding the course will be made in a subsequent issue.

Falling Pole Demolishes House.

The accompanying illustrations show a peculiar accident which occurred recently on a transmission line which was being constructed in the South. A 55-foot creosoted pole was being raised by means of a "gin" wagon and "A" frame when



Cottage After Fall of Pole.

the men lost control of the pole and it fell, striking the roof of a nearby cottage. As will be seen from the illustration, the heavy pole crushed through the house like it was paper. There were five persons sitting on the front porch when the accident happened and the most remarkable part of the occurrence is that not one of them was injured.

COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

Ellensburg Municipal Plant Forced to Increase Rates.

The city of Ellensburg, Wash., has recently adopted a new schedule for lighting and power service at the municipal electric plant. These revised rates represent an average increase of about 10 per cent over the charges formerly in force, and are as follows:

Lighting: First 60 kilowatt-hours, 10 cents per kilowatt-hour; next 90 kilowatt-hours, 9 cents per kilowatt-hour; next 120 kilowatt-hours, 8 cents per kilowatt-hour; and so graded down until a rate of 2 cents per kilowatt-hour applies on all consumption over 1,000 kilowatt-hours per month. Minimum, $1 per month. Service outside of city limits, 2 cents additional per kilowatt-hour.

Power: First 100 kilowatt-hours, 6 cents per kilowatt-hour; next 175 kilowatt-hours, 4 cents per kilowatt-hour; next 300 kilowatt-hours, 3 cents per kilowatt-hour; next 500 kilowatt-hours, 2 cents per kilowatt-hour, and so graded until a rate of one cent per kilowatt-hour applies on all consumption over 1,075 kilowatt-hours per month. Minimum, $1 per month per horsepower connected.

Cooking: Net flat rate of 3 cents per kilowatt-hour. Minimum charge, $1 per month.

Meter Deposits: Business lighting, $10; power, $10; residence service, $5; cooking, $5. A 10-per-cent penalty is enforced when bills are not paid within 10 days of date.

This general increase is said to be due to the inability of the plant to meet expenses at the former rates, and to cover the large number of lighting warrants outstanding, some for periods of more than three years. In commenting upon this action, a paper of one of the neighboring communities says:

"After furnishing cheap lights until they had buried the plant under a mountain of debt, Ellensburg's public benefactors awakened to the unpleasant knowledge that hereafter they would either have to charge monopoly prices for light service or let the town go dark. That sort of public welfare work which drags the public into business requiring all the care and ingenuity of skilled management to make it a success is generally nothing but plain foolishness."

Efficiency in Telephone Conversations the Trend of Utility Companies.

The crisp telephonic salutation, "hello," but which is not always courteous or dignified, is fast disappearing as a result of the general trend toward efficient telephoning. Corporations transacting thousands of dollars' worth of business through the medium of the telephone are fostering this general movement, and the work being done in that field by the New York Edison Company is a conspicuous example. Here the "hello" has gone forever, and in its place has been adopted a new form of response in which the person answering the call states first the name of the bureau or office in which the call is received, following which the name of the individual is announced. The person calling then knows immediately whether the call has reached the proper destination.

To insure telephone efficiency the New York Edison Company has undertaken a certain amount of educational work in the form of a series of lectures. The necessity of courtesy and accuracy in answering questions or referring calls to the proper individuals is emphasized. The matter of voice is also touched upon, and a pleasant easy conversational tone with a rising inflection, although not of too much volume, is urged.

Courtesy Over the Telephone.

One of the principal rules governing the conduct of employees of the New York Edison Company having intercourse with the public over the telephone is to be as courteous as in a personal conversation. Herewith is a view of the company's main switchboard.

The fact is pointed out that it is far more difficult to transact business by means of the telephone than by a direct interview, and consequently it is more difficult to show real courtesy. Moreover, during telephone conversations people are far more apt to become impatient. Such being the case the Edison company employees are urged to be courteous under every condition. The company will not countenance sharp tones, abrupt manners and other faults that are often developed in telephone conversations. The fundamental principles of using a telephone instrument are also emphasized.

Municipal Plant Conducts Electric Range Campaign.

Instances of municipal electric plants engaging in appliance campaigns of any great magnitude are so rare that when such an example is found it is worthy of special mention. The case of the municipal electric light plant at Portland, Ind., has already been mentioned in these columns. The municipal light department at Reading, Mass., is another company which is operating a successful range campaign. Full-page newspaper advertisements are being used and customers are permitted to purchase ranges at cost, on a basis of $5 down and $5 per month. Electric ranges manufactured by the Globe Stove & Range Company, of Kokomo, Ind., are used in the campaign. The special offer to sell ranges at cost on the installment plan is made for the month of May only.

Record-Breaking Campaign in Minneapolis

During "Wire-Your-Home" Month Local Central Station Secured Contracts for Wiring 595 Old Houses at a Comparatively Low Cost

There was little or nothing in the official news from the sales manager's office of the Minneapolis General Electric Company prior to March 15 to indicate any great change in the old house-wiring situation. Most of the reports indeed were thoroughly non-commital, and only the fact that "Wire-Your-Home Month" was to be held from March 15 to April 15 had perhaps been mentioned once or twice by an already busy force of salesmen. Certain events, however, seemed to have some significance; but in general similar campaigns conducted throughout the country have little altered the general situation in Minneapolis, so nothing phenomenal was expected.

The Plan of Attack.

Immediately upon receipt of word from headquarters of the Society of Electrical Development that preparations would be made for the battle of "Wire - Your - Home Month" and which reached Minneapolis about January, 1916, a little force of men in that city started to lay out a line of attack that was designed to add to the number of residence customers.

The forces of the Minneapolis General Electric Company consisted of six men, well trained, well armed, everyone having been through the battle of electricity versus gas, and the force as a whole working under directions from a man situated well back from the line of action, but who planned every line of attack, even to the day, the hour and the minute. In other words, the plan of action and the seat of battle were all so carefully arranged that the battle was practically won even before it had been commenced.

The line of attack was this: As soon as "Wire-Your-Home Month" was announced, each of these six men was directed to hand in at least two names of home owners every day, whose homes were situated right on the company's lines. Several of the men, however, listed more than two names per day. This gave the man, at the base of action, excellent material and the exact spot into which to shoot a series of circular letters epecially designed for the occasion. About 250 names were secured in this way, every one of which received three circular letters, and in addition a very attractive little booklet on house wiring; all of this before a word had been mentioned regarding "Wire-Your-Home Month," and incidentally the whole series was so arranged that each one of these 250 prospects received the last letter two days before the battle commenced.

WHAT MINNEAPOLIS DID

During a period of 30 days secured 595 residence customers at a comparatively low cost per customer.

Divided the city into six districts with a man to each district.

Followed personal calls with letters and newspaper advertisements, featuring a $50 plan. The average contract, however, called for a $75 installation.

Turned over all wiring contracts to local contractors, who co-operated in the campaign.

The first feature of the campaign was a 40-inch advertisement, as shown in Fig. 1 This $50 offer with the pictures of the fixtures appealed so strongly to every class of people and every size of house that the decision was instantly reached to continue this line of attack throughout the whole campaign, and the results most certainly proved that somewhere in that advertisement was something that "gets under the skin." Over 50 customers were secured from the first publication.

The post card, shown in Fig. 3, was next sent to all prospects, and as a result five per cent of all remaining on the special list were secured as customers.

"National House Wiring Month"
$50 March 15th to April 15th $50
An Example of House Wiring Bargains
$50 6 Rooms, Wiring and Fixtures Complete, Ready to Burn $50
THIS OFFER FOR ONE MONTH ONLY
We are also giving Electrical Premiums during "Wire Your Home Month"
Try Electric Cooking at the New 2½-Cent Rate
DROP into our new Electric Range Display Room any afternoon at 2:30 o'clock and see a wonderfully interesting demonstration of Electric Cooking.
The first 100 persons who purchase electric ranges from us will buy at specially low prices—unusual concessions simply to introduce electric cooking in the various neighborhoods of the city.
Visit our Display Room and Electric Cooking Demonstration.
The Minneapolis General Electric Company
15 SOUTH FIFTH STREET
Main 6100 TELEPHONES Center 1320

Fig. 1.—Initial Newspaper Advertisement of Minneapolis Company.

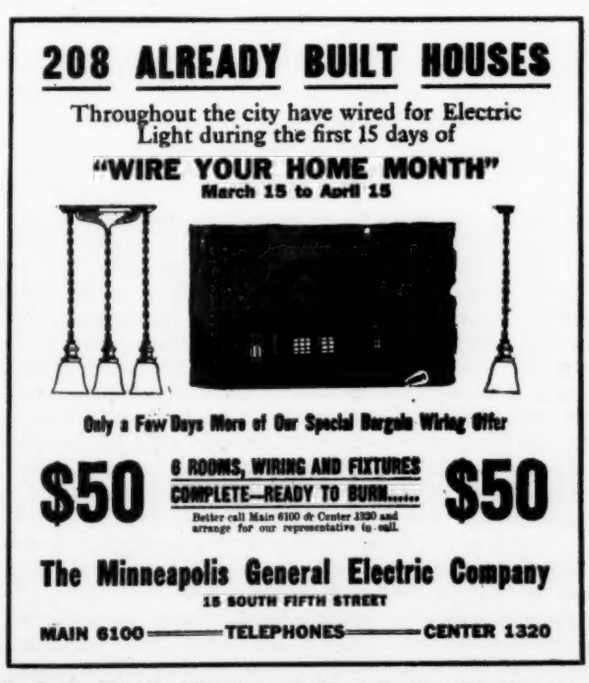

208 ALREADY BUILT HOUSES
Throughout the city have wired for Electric Light during the first 15 days of
"WIRE YOUR HOME MONTH"
March 15 to April 15
Only a Few Days More of Our Special Bargain Wiring Offer
$50 6 ROOMS, WIRING AND FIXTURES COMPLETE—READY TO BURN..... $50
Better call Main 6100 or Center 1320 and arrange for our representative to call.
The Minneapolis General Electric Company
15 SOUTH FIFTH STREET
MAIN 6100 TELEPHONES CENTER 1320

Fig. 2.—A 40-inch Advertisement Used During the Campaign.

The persistence of the 40-inch advertisement which was being used once a week in each of the three English dailies created a condition that became a serious sales problem. In the words of the director of the campaign: "The company's original attack was successful and although many customers

A Complete Modern Electric Equipment in Your Home at a Price You Can Afford to Pay!

$50 Wires a Six Room House Complete with Fixtures, ready to light. **$50**

Phone us or send the attached card NOW.

Center 1320——Telephones——Main 6100

.....

*Date*_____*191*__

Please have your representative call and inform me fully as to your housewiring plan, without any obligation on my part, of course.

Name _____

*Address*_____

*Best time to call*_____

Fig. 3.—Mailing Card Sent to All Prospects.

had been secured within the first few days, the importance of our continuing was perfectly clear. The situation, however, upon the insertion of the second advertisement entirely changed matters, for it was at once plain that our inability to care for the business would not only tax our capacity but mean the complete abandonment of many good prospects if something was not done at once. However, this proved of little consequence, for the man directing the forces had made ample preparation for such a contingency.

"What he did was to arrange a neutral territory between each salesman's district, declare this a neutral zone and instructed the salesmen on each side of this particular zone to shoot to kill, and from the results secured each man liked shooting in a foreign territory.

"By this time it had been demonstrated that in this campaign arguments why a man should use electricity were far less important than they used to be. The gas company's line of defense as regards cost, for example, which has withstood so many attacks, is now supported by scarcely a single regular argument. Other contentions, supposed to be almost impregnable, gave our salesmen no great trouble and it is really significant that the greatest portion of the victims collapsed almost at the outset, while many of those who resisted at first literally begged for mercy after the last shot, shown in Fig. 4, had been fired.

"Under such circumstances, it must be assumed that the gas company was acutely conscious of the moral effect of admitting such a terrible loss in the battle of 'Wire-Your-Home Month' and that they were ready to sacrifice almost any number of lives rather than publish such an admission was well supported by the fact that they advertised gas ranges during the whole of the campaign.

"In summary, the month's fighting cost the gas company 595 lives and has given impetus to a movement which will be felt for many months to come. The occupation of 595 homes represents a definite success for the Minneapolis General Electric Company, but it will be of inestimable value if followed up by a similar number in the fall, and then again in the spring.

"While the residential fighters were pressing the attack in the outskirts, the down-town salesman likewise directed an assault against the gas mains, a special drive being made on individual locations, using both gas and electricity. The ammunition in this campaign, which, by the way, we called "Wire-Your-Store Month," consisted of a very personal letter from the sales manager, followed by a personal call from the salesman on the following day."

Details of the Campaign.

The actual part played by the local central station was to produce the inquiries, have the district salesman give expert advice as to the best layout, suggest the best type of fixtures, and then turn the job over to the contractors; in other words, the central-station salesmen merely acted in an advisory capacity and saw to it that each applicant secured what he should have, what was good for him and what he really needed in the way of both wiring and fixtures, rather than what he thought he ought to have while under the influence of the $50 offer. That it pays to encourage people to give expression to their individual tastes and pays to cater to their various hobbies was proven by the results of the campaign.

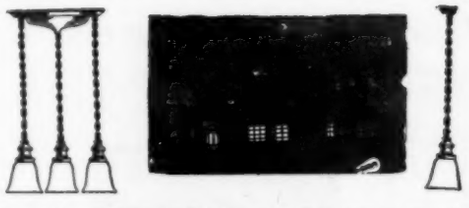
Indeed, although the specific sales device throughout the whole campaign, was "Wire Your Six-Room Home for $50," including fixtures, by far the greater number of homes wired were of the larger and better class, while the average price per contract was slightly greater than $75.

Table 1 gives a condensed report of the actual results, 539 being the total number of individual inquiries, resulting in 595 new customers on account of the number of owners of other than single dwellings answering the advertisement.

RECORD OF SALESMEN IN CAMPAIGN.

Salesman	Contracts Closed and Wired	Contracts Closed to be Wired	Total
Hogan	94	33	127
Dahl	92	33	125
C. W. Loring	110	15	125
Frizzell	48	33	81
Nelson	59	12	71
Pelletier	60	6	66
Totals	463	132	595

$50 WIRE YOUR HOME $50



Saturday Will Be Your Last Opportunity

to get your house wired on

Our special Bargain Offer

$50 6 ROOMS, WIRING AND FIXTURES COMPLETE—READY TO BURN **$50**

Call Main 6100 or Center 1320 before it is too late and arrange for our representative to call

THE MINNEAPOLIS GENERAL ELECTRIC CO.

15 SOUTH FIFTH STREET

Fig. 4.—Final Advertisement in Campaign.

Operating Costs of Boston Incandescent Street Lamps.

Interesting data on the cost of operating incandescent street lamps of various sizes in Boston are contained in an exhibit presented by the Edison Company in the investigation of prices now being made by the Massachusetts Gas and Electric Light Commission.

Yearly maintenance and operating expenses for 2,299 series and 1,784 multiple lamps are as follows:

Series Incandescent Lamps:		
1,517	40-cp., 48.8 watts, @ $6.63	$10,057.71
781	60-cp., 67.2 watts, @ 6.63	5,178.03
1	100-cp., 100 watts	7.07
		$15,242.81
Multiple Incandescent Lamps:		
1,393	40-cp., 60 watts, @ $11.65	$16,228.45
376	60-cp., 80 watts, @ 12.46	4,684.96
10	100-cp., 100 watts, @ 12.19	121.90
2	250-cp., 250 watts, @ 14.20	28.40
3	320-cp., 400 watts, @ 17.29	51.87
		$21,115.58

Note.—In several instances, the next larger standard size of lamp than that called for in the city contract was used.

Stock room, record and billing expenses added $1,520.75 to each group of lamps, giving an average maintenance and operating cost, for the series lamps, of $7.29; and for the multiples, $12.69, Improved Gem lamps being installed.

Detailed costs were as follows:

	40-cp. Series		40-cp. Multiple
Labor	$1.80		$ 9.51
Transportation	1.37		
Lamps, 3.55 @ $0.65	2.31	3 @ $0.30	.90
Miscellaneous material	.15		1.00
Fixture	1.00		1.00
	$6.63		$11.65

	60-cp. Multiple
Labor	$ 9.51
Lamps, 3 @ $0.57	1.71
Miscellaneous material	.24
Fixture	1.00
	$12.46

	80 and 100-cp. Series		100-cp. Multiple
Labor	$1.80		$9.51
Transportation	1.37		
Lamps, 3.55 @ $0.775	2.75	3 @ $0.48	1.44
Miscellaneous material	.15		.24
Fixture	1.00		1.00
	$7.07		$12.19

	250-cp. Series		250-cp. Multiple
Labor	$1.80		$ 9.51
Transportation	1.37		
Lamps, 3.55 @ $1.50	5.33	3 @ $1.15	3.45
Miscellaneous material	.15		.24
Fixture	1.00		1.00
	$9.65		$14.20

	400-cp. Series		400-cp. Multiple
Labor	$ 1.80		$ 9.51
Transportation	1.37		
Lamps, 3.55 @ $2.65	9.40	3 @ $2.18	6.54
Miscellaneous material	.15		.24
Fixture	1.00		1.00
	13.72		$17.29

Labor costs are as follows:

Series Lamps:	
Part time, 6 patrolmen, 1 troubleman, 4 clerks	$3,950
Transportation, full time, 1 auto; part, 6 single teams	3,006
Average number lamps in service	2,197
Average labor cost per series lamp, all sizes	$1.80
Average transportation cost per lamp, all sizes	1.37
Multiple Lamps:	
Full time, 14 switchmen; part time, 26 switchmen and 1 foreman	$16,931
Average number lamps in service	1,780
Average labor cost per multiple lamp, all sizes	$9.51

No tungsten lamps are installed on the Boston street lighting system. Type C Mazdas are not recommended for direct-current series service with arcs and the smaller sized Mazda lamps are not considered as desirable for street lighting service in multiple as the lamps installed.

Central Station Advertises Community in Booklet.

"Industrial Opportunities in Sandusky, Ohio," is the title of a pamphlet just issued by W. S. Barstow & Company, managers of the Sandusky Gas & Electric Company.

The pamphlet contains every item of information concerning the Ohio city which would be of value to an investor seeking a location for a new industry.

The information is compiled under the following headings: Population, Natural Resources, Agricultural Resources, Transportation Features, Public Utilities, Financial Resources, Existing Industries, Factory Buildings and Sites, Educational Institutions, Health Conditions, Religieuos Institutions, Civic Improvements, Labor Conditions, Commercial and Industrial Organizations, Secret and Social Organizations, Amusements and General Information.

The pamphlet is issued in pursuance of the Barstow policy of assisting in all possible ways the industrial development of communities in which the company operates public utilities. Similar pamphlets are in course of preparation for the other cities whose utilities are controlled by the General Gas & Electric Company, the Barstow holding corporation.

Louisville Company Arranges With Banks to Pay Customers' Bills.

Current statements of the Louisville Gas & Electric Company, in the interest of expediting collections, contain slip-ins suggesting that by signing the form on the back the consumer can always get his discount and save himself trouble by paying his bills through his bank. The proposition is stated as follows:

"Many hundreds of the customers of this company never see their bills for gas and electricity until their banks return them along with their checks at the end of each month. Customers who do this always get their discounts, and are saved the trouble of remembering to pay their bills. They do not lose any of their right to have a bill corrected.

"If you desire to avail yourself of this convenience, fill out and sign the form printed on the back of this slip, and this company will make arrangements with your bank, and will in future present the bills to the bank, and you will receive the receipted bill along with your checks."

The form is as follows:

Louisville, Ky., ... (date) .....

To Blank Bank: Please pay the Louisville Gas & Electric Company the net amount of its bills for gas and electric service rendered to me at Blank Number and Street upon their presentation, and return the receipted portion of the bill to me with the paid checks drawn on my account. Yours very truly, etc.

War Effect on Waste-Heat Stations.

The quantity of electrical energy generated in the waste-heat stations of the Cleveland & Durham Electric Power, Limited, of England, has been seriously reduced by the fact that hematite iron has been largely substituted for Cleveland iron, and the result has been that the gases available for the waste-heat stations have been much reduced. Last year the volume of energy delivered to the company from waste-heat stations was reduced by about fifteen million units as compared with the previous year. Energy has therefore had to be supplied from coal fires at Grangetown station, so that the coal bill which in 1913 was only $4,225 rose in 1915 to $82,020. Charges to consumers will be raised and it has been resolved that future policy shall insist upon a graduated scale of prices varying with the price of coal.

Campaign for Motor-Driven Pump Business.

The planting season is taken advantage of by the Boston Edison Company in promoting the adoption of water pumping with electric motors, by farmers, market gardeners and owners of estates in the outlying regions of its territory. The company is co-operating with the manufacturers of electrically driven pumps in making a thorough canvass of such prospects.

POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

Savings Effected by Pumping Oil Wells by Electricity.

In most oil fields, particularly in California, the necessity for variable pumping speeds is marked, on account of the variation in the flow of oil, and in the amount of sand accompanying it, also in the amount of gas or water in the oil, the viscosity of the fluid and the condition of the pump. It is also desirable to shake up the well, which is substantially the operation of the walking beam, at a high speed for a few moments, in order that the sand may be dislodged from the pump valves, which it has a tendency to clog up. The great variation in the flow of wells, and even in the flow of the individual well at different times is well illustrated in the accompanying table of power required for pumping 213 oil wells in California:

	Barrels per Well per Day	Depth of Wells	Kilowatt-Hours per Well per Day	Kilowatt-Hours per Barrel Pumped
Maximum	230	3,110	123.4	5.843
Minimum	10	900	27.7	0.414
Average	122	1,430	80.8	0.683

The method of drilling oil and gas wells by the cable-tool or rotary process, or a combination of the two, is well known, but the fact that electric power has been applied in the operation of drilling plants is not a matter of such general knowledge. The cable drilling tools are suspended from a walking beam by a steel wire or manila rope; practice varies with drilling conditions as regarding the kind of rope used, but it is customary in localities where steel wire rope is used to drill the first few hundred feet of a well with manila rope before changing to steel wire. The reciprocating motion of the walking beam attached to the drill by means of the cable constitutes the essential portion of the drilling process. Drillings are mixed with water in the hole and are removed by the bailer. In rotary drilling a rotating column of pipe has mounted upon its lower extremity a cutting bit, which is lowered into the well and operated in much the same manner as in diamond drilling. The drillings are washed out of the hole by forcing muddy water or thin mud through the pipe. This flows up on the outside, bringing the drillings to the surface, filling up the interstices in the soil or rock through which the well is drilled. The power required for drilling is not only dependent upon the difficulty with which the ground is penetrated, but also upon the amount of trouble experienced in handling casing and in fishing for lost tools, and, is, therefore, extremely variable, but some representative figures can be given.

The cost of electric power for pumping wells on several properties in the California oil fields, which properties comprise 197 wells, varying from 750 to 2,700 feet in depth, varied from $0.65 to $1.21 per day, with current at $.01 and $.015 per kilowatt-hour, and the average cost of pumping 8 wells, depth 1,000 to 2,800 feet, amounted to $5.41 per day by steam power, but by changing to electric power the average cost was cut to $3.49 per day.

Twelve wells having an average depth of 1,100 feet pumping oil of 15.5 degrees Baume, show a saving by electricity over steam of $1.24 per well per day, and 107 others, pumping oil at 13.5 degrees Baume, from an average depth of 800 feet, show a saving by electricity over steam of $1.32 per well per day.

The cost of electric power for drilling in California oil fields, with a power rate of 1.5 cents per kilowatt-hour is, for depths of 735 feet, $0.1074 per foot drilled; for 1,493 feet, $0.1025; 945 feet, $0.0915; 1,356 feet, $0.1060; 824 feet, $0.0570; 732 feet, $0.1040, and for 1,175 feet, $0.0848. Electric power does away with much of the danger from fire, which is present when a steam boiler is kept in operation in close proximity to the well, and thus reduces the insurance rates. Where water is scarce the motor also has the advantage of not requiring water for the generation of its power; the condition of the well may also be determined, for the measuring instruments indicate slight differences in power requirements, and thus give warning of unusual conditions affecting the work.

Government To Construct Water-Power Plants for Manufacture of Nitrogen.

If the House of Representatives concurs in what is known as the Smith amendment to the Chamberlain army reorganization bill, the United States Government will build and operate one or more water-power plants for the manufacture of atmospheric nitrogen. This product, in turn, will be utilized by the Government primarily in the manufacture of explosives for the army and the navy, and any surplus not required for this purpose may be disposed of as the Secretary of War may direct.

The Smith amendment first made its appearance in Congress as a bill designed to build and equip a government plant for the manufacture of nitrogen fertilizer, any surplus product to be used for the production of explosives for the army and navy. As a fertilizer bill, it was referred to, and reported by the Committee on Agriculture, but as it emerged from that committee, it provided primarily for the manufacture of atmospheric nitrogen for war and navy uses, the fertilizer product being incidental.

Senator Smith then offered his bill, as reported, as an amendment to the army reorganization bill; it was referred to the Military Committee, and by that committee, referred back to the Senate without recommendation. After days of discussion, the amendment was further altered, and finally adopted by a vote of 43 to 22.

As adopted, the Smith amendment authorizes the President to set aside, for the exclusive use of the United States Government, not to exceed five water-power sites upon navigable streams, the selection to be made by the Secretary of War.

An appropriation of $15,000,000 is made to enable the Secretary of War to build dams, power houses and purchase equipment necessary for the generation of electrical power, and for the production of nitrates and other products needed for munitions of war, and useful in the manufacture of fertilizer. He further is empowered to purchase, or acquire by condemnation, any patented processes by which atmospheric nitrogen, explosives and fertilizer are produced, and any other property necessary for the construction and operation of the proposed government plant or plants.

Talks to Central-Station Power Salesmen

By C. H. Stevens
Manager, Power Engineering Bureau, Brooklyn Edison Company

This is the sixth and last of a series of articles by Mr. Stevens, dealing with the salient features of power sales work. Preceding installments have dealt with the equipment and qualifications of the salesman, arguments and talking points for central-station power and functions of a power bureau. The present article concludes the description of the various forms and records used so successfully by the Power Engineering Bureau of the Brooklyn Company.

Factory Bulletin File.

In addition to soliciting business in Brooklyn, it has been found both feasible and profitable to solict business from distant localities by following leads which are obtained from various trade journals, papers and clipping bureaus. Form letters are sent those to whom it is thought Brooklyn can show special inducements in the way of labor costs, railway rates, sites for building or renting. All of the various advantages of Brooklyn for manufacturers are brought to the attention of the company considering the change, and, of course, the advantages of Edison power are also dwelt upon. In connection with this a card system is used to follow the various leads and show the final disposition of each proposition. On these cards are noted the origin of the lead, the name of the firm and the business engaged in. Also the forms of letters, data and advertising matter sent. These are followed until a definite decision has been made by the manufacturer as to his location. Fig. 1 shows a card used to keep a record of the activity.

Loft Building Record.

As there are many inquiries both from local manufacturers and from out-of-town prospects regarding available buildings and sites for manufacturing, a file of loft buildings and factory sites is kept for reference. The cards contain information such as location, type of building, kind of power supplied, if there is a railroad siding or docking facilities, space available, cost of space, height of ceiling and if for light or heavy manufacturing purposes. By referring to this file inquiries can be answered immediately and any prospective user of power is impressed when he finds how able and willing the Edison Company is to help him in finding a suitable location. When an inquiry of this kind is received, location of lofts which most nearly meet the requirements are given and the loft building owners are notified so that they may start negotiations with the prospect. This encourages both manufacturer and loft building owner to use electric service. Loft building record cards are shown in Figs. 2 and 3. Fig 3 is the reverse side of the card and provides space for complete follow-up data.

Electric Vehicle Record.

Due to the growth of the electric vehicle it is found advisable to keep a garage-record file similar to the plant-record file (described in April 29 issue) for all garages, both public and private, in Brooklyn. This record gives the owner's name, location, number and size of cars in garage, also the number of charging outlets and their capacity. The record of electric vehicles in Brooklyn is kept up to date by referring to the state record of vehicle licenses. The electric-vehicle engineer by referring to the garage-plant record can determine the number of cars in Brooklyn, the depots at which they may be charged and in general keep pace with this new branch of the central-station industry. He may also gather many valuable talking points and show the many applications of the

FACTORY BULLETIN FILE Serial No. E-96

NAME X Typewriter Company

ADDRESS 1044 Greenudge St., Detroit, Mich. SOURCE Luce

Mich. Detroit. -- The X Typewriter Co. of 1044 Greenidge Street, this city has outgrown present plant and facilities in this city and is desirous of securing a suitable site in the New England or middle Atlantic section for the establishment of a modern new plant where excellent shipping facilities can be secured. Good and sufficient help will also be considered

LETTERS SENT		ANSWERS RECEIVED	
Date	Form No	Date	Remarks
2-7-15	E	2/12/15	No definite plans for moving at present time.
2/15/15	Ans.S	2/15/15	Want accurate figures on labor costs and factory sites.
2/19/15	Spec.Letter		Want power rates and suitable lofts.
2/23/15	" "	2/28/15	Advised that Mr. Brown, V.P. will be in city the 1st. to look over situation.

191—F7124 OVER

Fig. 1.—Factory Bulletin File Used by Brooklyn Edison Company.

LOFT BUILDING RECORD Station No. B-142

	NAME	ADDRESS	TEL. NO.
BUILDING	Lane Building No.2 Inc.	731 Broad St.	000 Main
OWNER	Est. of J. G. Lane		
AGENT	Sherman Realty Co.		

KIND OF CONSTRUCTION MILL CONCRETE yes HEAVY MFG. yes LIGHT MFG. FIREPROOF yes

DIMENSIONS (Int.) 130 x 200 HEIGHT OF CEILINGS 12 ft. NO. OF FLOORS 10

SPACE AVAILABLE Two entire floors and basement

COST PER SQ. FT. $ .25 INCLUDING THERM. HEAT yes A.C. yes PASSENGER ELEVATOR FREIGHT ELEVATOR both

KIND OF POWER: STEAM no. ELECTRIC yes D.C. yes EDISON SERVICE yes

LIVE STEAM AVAILABLE FOR MFG yes COST .45 per 1000 lbs.

LOCATED ON DOCKS SIDING yes NEAR DOCKS SIDING yes

REMARKS

DATE 4/20/14 REPORTED BY A. B. C.

Fig. 2.—Loft-Building Record.

DATE	INQUIRIES	RESULTS
3/2/15	Apex Cloak Corp.	Not suited for clothing manufacturing.
4/6/15	Union Stamping Co.	Building to far from labor required.
5/1/15	X Typewriter Co.	Leases signed for two floors with year's option on basement and additional floor.

Fig. 3.—Reverse of Loft-Building Card.

electric vehicle. This record is also valuable to the central-station management as statistics may be gathered on probable growth, revenue received, and rates which should be charged for this class of business. Fig. 4 shows a garage record card. On the reverse side space is provided for tabulating results of calls, etc.

Service Inspection.

It is, of course, as necessary to keep present customers as it is to obtain new ones, and it is particularly necessary to have customers satisfied. They are the company's best advertisement and from them come the repeat orders or orders for additional business.

After a salesman has succeeded in obtaining the signature on a contract he should not feel that his relations with that particular customer have ended, rather he should feel and the customer should be made to feel that there still exists a personal interest in him and his business by the central-station company. It is obviously impossible for a power salesman to keep in touch with all those whose business he has obtained, but he should or rather his company should have a system to supervise from a power selling standpoint the service of all customers from whom the revenue derived places them in a class which warrants such supervision. At the present time fully 30 per cent of all new business contracted for is additional business. Many times, however, the customer who is using central-station power in conjunction with a power plant will, when the time arrives for an installation of additional equipment, consider driving this additional load from his plant, rather than connect it to the mains of the central station. Again, a customer considering a large increase in his power equipment may take recourse to a private-plant installation because he is not thoroughly familiar with the power rates, believing that an increased consumption would be paid for at the same rates at which he is at present buying power, and knowing that for such amounts as he will use it can be generated very much more cheaply than his present units costs.

If such customers are not lost sight of through the regular routine of the company, but are supervised by some system which we will call "Service Inspection," it is safe to say that the power bureau will be acquainted with any proposed changes and be prepared to meet them with attractive rates and thus obtain the additional business. It was with this in mind that the Brooklyn company organized a Service Inspection Bureau, whose function it is to keep in direct touch with all large customers. All customers whose annual bills total over a certain amount are included in this file. Their bills are checked by an assistant power engineer and entered on the service inspection card before being sent to the customer. This prevents mistakes which might creep in through bills being handled in the regular routine methods. An unusual change in current consumption, maximum demand or bill is immediately questioned and an investigation started to determine its reason.

Periodic calls are made by a power salesman who tactfully inquires as to the satisfaction of the customer with the service, and if there is any prospect for additional business. Frequently a customer may have some simple grievance against the company, which, if brought to the attention of the one in charge of service inspection can readily be adjusted. This prevents small grievances from becoming serious, and has proved very efficient in keeping in touch with the customer's power requirements and in more than one instance has forestalled the installation of private-plant apparatus. It also is the duty of the men in charge of service inspection to keep the customers acquainted with all new developments in electric consuming devices, and advise the installation of newer and more efficient apparatus to replace that of older type, thus keeping the consumer abreast of the electrical times.

Customers have many times shown their appreciation of the interest taken in them, and this has established a closer relationship between the customer and company.

PLANT RECORD (Garage) Station No. B-12

NAME Electric Garage Co.

ADDRESS 125 Spruce Street

PRIVATE GARAGE PUBLIC Public

	Number of	Hp.	750	1,000	3,000	4,000	7,000	10,000
1. HORSE DRIVEN								
2. GASOLINE								
3. COMMERCIAL ELEC			4	16	2	4		
4. PLEASURE ELEC.	12							
TOTAL								

NO. OF CHARGING OUTLETS 15 SIZES 3-40, 5-60, 4-75, 2-100 Amp.

MIN. BOOSTING CHARGE $ .50 CHARGE PER KW HR. 5¢

MOTORS 1-15 1-5 LIGHTS 75-50w

REMARKS 4 - 2 ton trucks equipped with Edison batteries.

DATE 4/23/15 REPORTED BY B. I.

Fig. 4.—Garage Record.

NAME ADDRESS

BUSINESS Philip Wagner Packing Co. 1416 - 38th Street

INTERVIEWED Mr. Geo. Wagner, POSITION Supt.

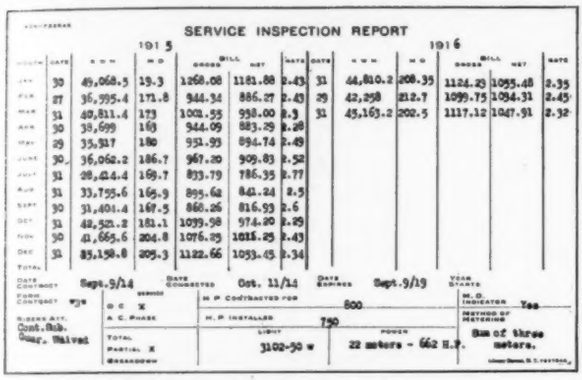
Meat Packers

DATE OF CALL	RESULT OF CALLS	CALL MADE BY
Feb.3/15	Saw Mr. Wagner re change in contract and service. Advised as to how the maximum demand might be lowered on the lighting installation by using tungsten lamps. Mr. Wagner spoke of additional equipment which might be put in within the next few months.	A B C
Apr.13/15	Service Inspection Call. Mr. Wagner states they are considering the installation of additional refrigerating apparatus and will probably drive it by steam engines as they can profitably use the exhaust steam for cooking.	"
Apr.29/15	Submitted figures to Mr. Wagner on cost of operating the additional 100 ton compressor on Edison Service. Find that rate of approximately 1.25¢ can be earned. Says that they will go into the matter very carefully before buying steam equipment.	
May1/15	Mr. Wagner states that Edison Service will be used on compressor.	

Fig. 5.—Inspection Record.

Figs. 5 and 6 show both sides of the service inspection card used by the Brooklyn Edison Company.

In concluding it must be remembered that the success of any central station or other public-service company depends very largely upon its sales force and its public policy. With this in mind the Edison company has made every effort to gather into its power bureau and service inspection department men of real sales ability and sound engineering and business experience. They are aided and encouraged by efficient systems for locating power prospects and materializing such into customers by arguments based on their own knowledge of power engineering, supplemented by information and data available in the bureau files.


SERVICE INSPECTION REPORT

1915 1916

	DATE	K W H	M D	GROSS BILL	NET	RATE	DATE	K W H	M D	GROSS BILL	NET	RATE
JAN	30	49,068.5	19.3	1268.08	1181.88	2.43	31	44,810.2	208.35	1124.25	1055.48	2.35
FEB	27	36,995.4	171.8	944.34	886.27	2.43	29	42,258	212.7	1099.75	1034.31	2.45
MAR	31	40,811.4	173	1002.55	938.00	2.3	31	45,163.2	202.5	1117.12	1047.91	2.32
APR	30	38,699	163	944.09	883.29	2.28						
MAY	29	35,317	180	951.93	894.74	2.49						
JUNE	30	36,062.2	186.7	967.20	909.83	2.52						
JULY	31	28,424.4	169.7	893.79	786.35	2.77						
AUG	31	33,795.6	165.9	895.62	841.24	2.5						
SEPT	30	31,401.4	167.5	868.26	816.93	2.6						
OCT	31	42,521.2	181.1	1099.58	974.20	2.29						
NOV	30	41,665.6	204.8	1076.25	1015.25	2.43						
DEC	31	85,158.8	205.3	1122.66	1053.45	2.34						
TOTAL												

DATE CONTRACT Sept. 9/14 — DATE CONNECTED Oct. 11/14 — DATE EXPIRES Sept. 9/19 — YEAR GRANTS

FROM CONTRACT YES — SERVICE: D C X, A C PHASE — H. P CONTRACTED FOR 800 — H. P INSTALLED 750 — M. C. INDICATOR Yes

RIDERS ATT. Cont. Sub. Over. Waived — TOTAL / PARTIAL X / BREAKDOWN — LIGHT 3102-50 w — POWER 22 meters - 662 H.P. — METHOD OF METERING Sum of three meters.

Fig. 6.—Service Inspection Report by Means of Which Customer's Bills Are Checked Monthly.

Electrically Operated Ice-Making and Cold-Storage Plant for Panama Canal Zone Nearly Ready.

The ice-making and cold-storage plant at Balboa, Panama Canal Zone, will probably be ready for occupancy about May 15. It has a capacity of 200 tons of refrigeration each 24 hours. The building which houses this plant is situated behind the Balboa commissary, and is 237 feet 6 inches long, 73 feet 4 inches wide, and one story high. In the middle of the building is the compressor room occupying the full width and 40 feet 4 inches long.

Two ammonia compressors of the De La Vergne horizontal double-acting type, with accessories, constitute the mechanical part of the equipment. Each compressor is driven by a 200-horsepower motor running on 2,200-volt, three-phase current. A pump-out machine is belt driven by a 15-horsepower motor.

Two freezing tanks made of steel occupy the tank room, which is 68 by 73 feet 4 inches. In this room are four agitators in pairs driven by 15-horsepower motors, three air blowers belt driven by 7.5-horsepower motors, one reciprocating floor pump driven by a two-horsepower motor, and electric cranes and hoists for use in lifting cakes of ice from the tanks. Each freezing tank contains 696 cans for making ice, and each can has a capacity of 300 pounds of ice.

An ice-storage room full width of the building and 35 feet 2 inches long, divided into ten compartments, each insulated from the others; and a cold-storage room 75 feet long and full width of the building, divided into 26 compartments, occupy the remainder of the building. It is possible that a small section of the building will be set off as a retail salesroom.

Economy of Electric Drive for Small Planing Mill.

The accompanying figures show the average cost of steam power for two consecutive years previous to the installation of electric drive.

First year	$1,176
Second year	1,366
Average yearly cost	1,271

The result of the same mill's operation by electric power for the first year (during which the mill was not operating under normal conditions) was as follows:

Total cost of energy	$419.00
Maximum bill for any month	55.00
Maximum KW hours for any month	920.00
Minimum KW hours any month	220.00
Maximum demand in H. P	16.50

Under normal operating conditions, the power bill would run from $55 to $60 per month. Estimating the average yearly power bill at $600, a saving of 50 per cent is shown over the previous cost of steam operation.

Satisfied Laundry Customer Advertises Electricity.

Electrification of laundries is often found a difficult proposition, owing to the requirement of live steam for process purposes. Several of the laundries at Springfield, Mass., are, however, electrically operated. The local company's power rates are particularly advantageous.

One Springfield laundry, the Royce Laundry, specializes in electrical processes. All its machines are motor driven, it has a large number of electric flatirons, and it also employs a process for deodorization and sterilization which consists of the passing of electric currents through the boilers in which the clothes are washed. This process, it is claimed, kills the germs, and does away with the necessity for using powerful chemicals, usually employed, which result in injury to the fabric. The Electric Process lends itself readily to newspaper featuring, as witness the accompanying advertisement.

Are You Going Foreward-or Standing Still?
'Twas the best we had
In those by-gone days,
But we've left that age
And its threadbare ways
THEN the Tallow Candle's rays
Relieved the gloom of night:
NOW, in these enlightened days,
We use Electric Light
THE ELECTRIC LIGHT OF TODAY
ARE
YOU
LIVING IN THE
"Then" or "Now"
AGE
?
TODAY WE LIVE IN AN ELECTRICAL AGE!
The crude methods of the Tallow Candle Age have been replaced by the Better, More Effective Way of doing things ELECTRICALLY—and chief among these is the Safe Way to Good Health in having your clothes washed by
THE PROCESS
AS USED EXCLUSIVELY BY THIS LAUNDRY,
WHICH GUARANTEES
STERILIZATION—DEODORIZATION,
NON-FADING AND RUNNING OF COLORS
AND LONGER LIFE TO LINEN.
BE PROGRESSIVE! HAVE YOUR WASHING DONE IN THE GOOD HEALTH WAY.
THE ROYCE LAUNDRY
'PHONE 1014

Advertisement of a Satisfied Power Customer.

ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

MODERN MOLDING-WIRING MAXIMS.

By Terrell Croft.

Wire for use in molding should have good (approved rubber) insulation because the conductors in molding, particularly in metal molding, lie close together. Furthermore, metal molding is always grounded, hence the insulation on the conductors in it is all that prevents them from contacting with each other or with ground. Wires having weatherproof or slow-burning insulation will ultimately give trouble if they are installed in molding, particularly where subject to dampness.

There should be no joints or splices within a molding system except at outlets, because the insulation on a splice is always inferior to that on the unimpaired conductor

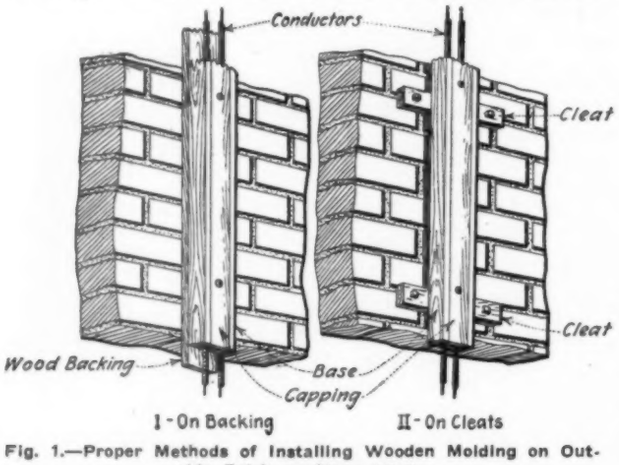


Fig. 1.—Proper Methods of Installing Wooden Molding on Outside Brick or Stone Walls.

and furthermore the bulkiness of a splice frequently, when the wires are in wooden molding, renders it necessary to cut away a portion or all of the tongue (in the molding base) which should always separate the conductors from one another. This weakens the base and may result in short-circuits. Also, experience has shown that there is a tendency on the part of wiremen to leave unsoldered and untaped the joints in molding, if such are made, and they frequently burn the backing when soldering splices.

Approved fittings must be used whenever it is necessary to splice or tap to a wood-molding-wiring conductor. In these fittings the wires are joined together with screw binding posts, rendering the use of solder unnecessary.

Why wires are permitted in wood moldings and are not allowed to touch wood when installed in accordance with the other methods of wiring is a question that is sometimes asked. The wires in a molding installation are installed in a specially prepared protecting raceway and should, under the conditions where molding wiring is permitted, provide adequate security to the conductors. On the other hand, wiring installed in accordance with the other methods is not permitted to touch wood because in these cases the wires can be run in locations where the wood might become damp and result in grounds on the circuit and consequent fire hazard.

The use of wooden molding is being discontinued in spite of the fact that the Code permits its use under certain conditions. Metal molding is safe and is being

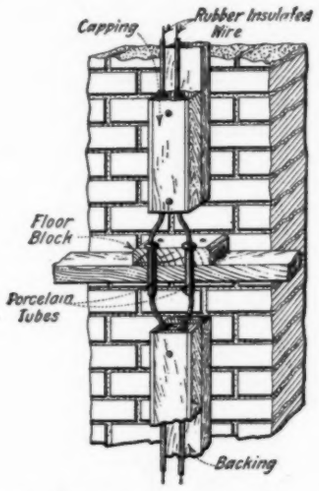


Fig. 2.—Molding Wiring Passing Through Floor.

widely applied, but in certain cities, in New York, for example, the installation of wooden molding is prohibited by the local municipal rules.

Molding wiring should never be installed in damp places. This applies to wiring in metal as well as to that in wooden molding. The conductors are close together and furthermore the structure of the molding is such that moisture can readily enter it. Hence, if it be used in a damp location, low resistance to ground and between conductors will result and trouble will, probably, ultimately occur. If the wood molding becomes damp, it may, at a weak point in the insulation on the conductors, constitute a high-resistance conducting path and carry current until it chars. Then it will ignite readily and may start a fire.

Outside brick and masonry walls are considered as damp places. Therefore, either metal or wood molding when it is carried along such walls should be separated therefrom in accordance with methods similar to one of those suggested in Fig. 1. The backing or cleats on which

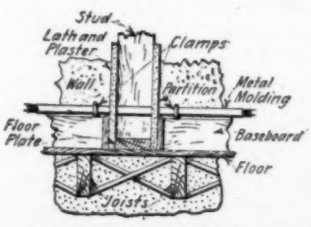


Fig. 3.—Metal Molding Carried Through Partition.

the molding is supported should be thoroughly painted or impregnated to prevent the absorption of moisture.

Where wood molding passes through floors it may be arranged about as suggested in Fig. 2. A floor block at least

two inches high should be fastened to the floor and holes bored through this block to accommodate the porcelain-tube bushings for the conductors. The function of a floor block is to raise the heads of the tubes high enough above the floor so that scrubbing water cannot enter them. The floor block and the lower end of the molding above it should be protected by wooden boxing, not shown in the illustration. Specially manufactured devices or "kick plates" can be procured to protect molding where it passes through a floor.

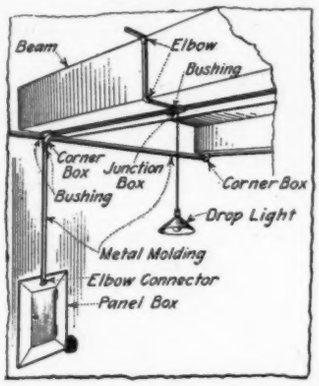


Fig. 4.—Typical Metal-Molding Installation.

The method of carrying a metal molding run through a partition is shown in Fig. 3. The base and capping of the molding must be continuous through the partition, that is, there must be no joints within the partition space.

Hardwood wooden molding only is accepted in certain cities where the use of wooden molding is allowed, it being maintained that the soft wood or white wood molding is of insufficient strength to properly perform its function.

In supporting wood molding care must be taken not to cut away too much of the groove in the backing. The tendency is, particularly when the molding is being clamped to the supporting surface with toggle bolts, to cut large gaps in the tongue of the backing. This weakens the backing and may permit the electrical contact of the conductors of opposite polarity in the molding through the nut on the toggle bolt.

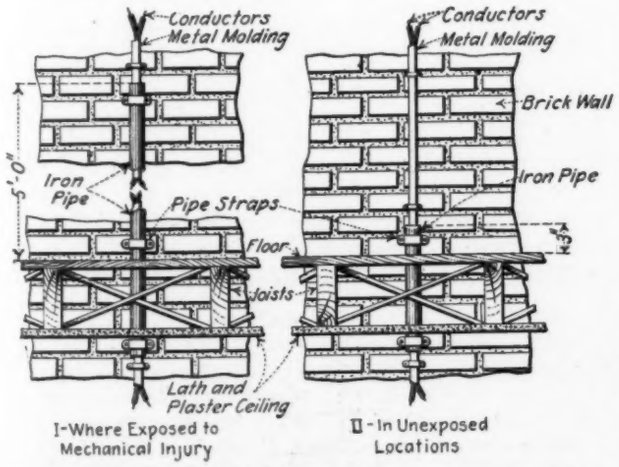


Fig. 5.—Protection of Metal Molding Where Passing Through a Floor.

The places where molding should not be used (this applies to both wood and metal moldings) are, in cellars, in damp places, out-of-doors, or in elevator shafts. In some cities, the use of molding is prohibited in churches and auditoriums. Wood molding should not be used in show windows, because of the liability of nails and tacks being driven through the capping and into contact with the conductors in these locations.

For alternating-current circuits in metal molding all of the wires of the circuit must be installed in the same molding because of the possible eddy-current and inductive-drop difficulties that may be encountered where one wire of such a circuit is installed in a molding. The reasons for this requirement are the same as those which dictate similar regulations for wiring in wrought-iron conduit.

The advantages of metal molding over wood molding are:

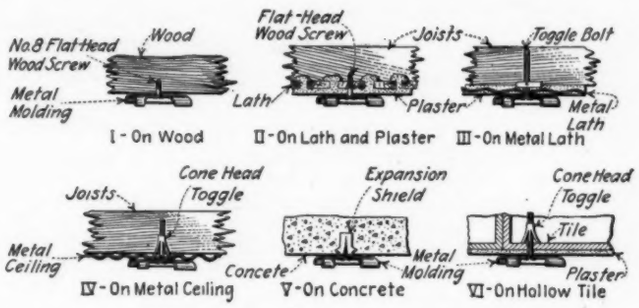


Fig. 6.—Methods of Supporting Metal Molding.

(1) It is non-combustible.
(2) It occupies less space.
(3) It affords greater mechanical protection.

As noted in a preceding paragraph, the use of wood molding is not allowed in some cities. A metal-molding installation is illustrated in Fig. 4, which indicates its adaptability for making extensions to existing wiring systems.

The requirements for the installation of metal molding are, in general, similar to those for wrought-iron conduit, because the function of the conduit is substantially the same as that of the molding. It is to provide a metal-lined raceway for the protection of the conductors.

The maximum wattage permissible on a metal-molding circuit is 1,320, and the maximum permissible voltage is 300. The fuses protecting circuits in metal molding should not be of greater capacities than six amperes.

Metal-molding systems must be continuous from outlet to outlet for the same reasons that it is essential that conduit systems be thus continuous. As with conduit systems, the metal-molding runs must be continuous both electrically and mechanically.

Outlet boxes and approved fittings for metal-molding wiring are manufactured in a great variety of forms. All splices in the system must be made within one of these fittings or boxes, since splices are not permitted within the molding itself. Wherever a metal-molding system joins wiring arranged in accordance with the knob-and-tube, conduit or open-work methods, the junction must be effected in an approved junction box, of which there are a variety of types, made especially for the purpose. Wherever conductors leave the metal-molding system to serve an energy-consuming device, an approved fitting which suitably insulates the wires from one another and protects them from abrasion must be used at the point where they emerge from the molding system.

Where metal-molding runs pass through floors they should be protected as suggested in Fig. 5. The iron-pipe protective tubing is installed for two reasons:

(1) To afford mechanical protection.
(2) To prevent scrub water from entering the molding.

In installing metal-molding protection on side walls at floors the continuous length of iron pipe should, where the molding might be exposed to mechanical injury, extend to a distance of at least five feet above the floor and

also downward through the ceiling below, and extend beyond the ceiling a few inches, Fig. 5, *I*. The protecting pipe can be held to the supporting surface with pipe straps. In locations where appearance is a factor and the metal molding on a side wall is not liable to mechanical injury,

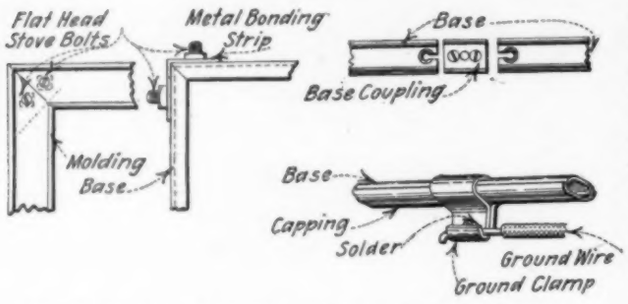


Fig. 7.—Methods of Bonding and Grounding Metal Molding.

as in residences and in office buildings, and where it is obvious that the mechanical strength of the molding and backing is of itself adequate, the iron-pipe protection may ordinarily extend from the ceiling below to a point only three inches above the floor, as shown in Fig. 5, *II*. In warehouses and factories, where mechanical interference is probable, the protection should extend at least five feet.

The methods of supporting metal-molding backing are illustrated in Fig. 6. In any case, the head of the bolt or screw which extends into the molding must not project into the wiring space or offer a sharp edge that might cut the insulation on the conductors.

Metal molding must be grounded for the same reasons that dictate the grounding of conduit systems. Positive grounding decreases fire and life hazard. The ground-wire connection at the metal molding is effected with a special ground clamp, as shown in Fig. 7. Where the ground is connected to the gas or water pipe affording the ground, a ground clamp is, ordinarily, also used. The ground wire should be soldered in each of these clamps.

The metal-molding system must be electrically continuous for the same reasons that a conduit system should be electrically continuous. To insure this condition, the different lengths of metal molding must be firmly joined together so as to constitute a good electrical contact and similar joints must be made at all outlet boxes. The fittings regularly furnished by the metal-molding manufacturers accomplish this result. In Fig. 7 is shown the

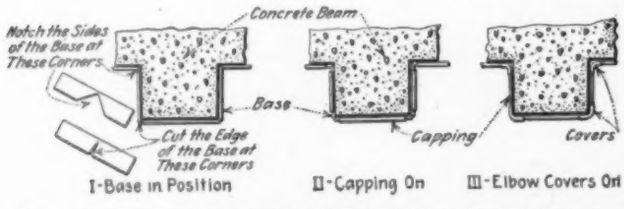


Fig. 8.—One Method of Carrying Metal Molding Around Beams.

method of joining abutting ends of metal-molding backing; also a method of making an improvised corner connection. Fig. 8 shows one of the methods of carrying a metal-molding run around a concrete beam.

Putty Knife As Electrician's Tool.

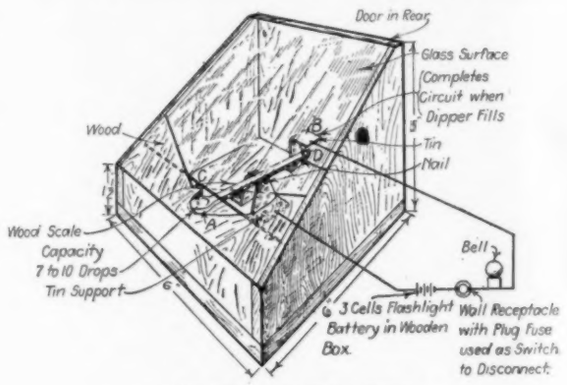
Cutting an inch off the end of a broad, heavy putty knife makes a tool which is invaluable for removing moldings, cutting tongues from floor boards, and other uses in place of a chisel. It will not scar as a wood chisel will and with the shorter length a better temper is found to stand prying, hammering and other abuses. R. Mason.

AN INGENIOUS RAIN ALARM.

By W. D. Wolf.

Being accustomed to sleeping with the windows of my room open during the night, I was sadly disappointed one morning to find that the rain had soaked my writing table and desk, with their contents, both of them being located next to a window. An ordinary rain does no harm, but if the rain is falling at a slant about 10 degrees off perpendicular it gets over the sill. In order to warn me during the night when it is advisable to close the windows I conceived the idea of the device, sketch of which is shown herewith, and found it to be entirely practical, having already served me well in numerous cases.

It is placed right under the sash of the open window and if the rain comes at an angle off perpendicular it strikes the glass surface, which is imbedded in putty, runs


Door in Rear
Glass Surface Completes Circuit when Dipper Fills
Wood
Tin Nail
Wood Scale
Capacity 7 to 10 Drops
Tin Support
Bell
3 Cells Flashlight Battery in Wooden Box.
Wall Receptacle with Plug Fuse used as Switch to Disconnect

An Ingenious Rain Alarm.

to point *C*, dropping to the spoon end *A*, which when filled throws up the other end of the scale *D* and makes contact with *B* and closes the circuit, ringing the bell. A fuse in series is used as a switch.

Louisville Abolishes Knob-and-Tube Wiring.

With the first of May, the Louisville (Ky.) City Building Inspector's office ceased writing permits for knob and tubing installations. The rush on the office was so great that additional clerks were pressed into service and the total number of permits issued between the time of the announcement that the new regulation would be effective on May 1, and that date, was 1,400. Beginnings were made on many of these installations sufficient to permit their being carried out under the old regulations. In connection with the imposition of the all-metal conduit installation regulation, the building inspector called attention to the fact that all wiring installed on and after May 1 must conform to Rule 15 of the National Electrical Code.

Contractors Co-operate in House Wiring at Springfield.

Fourteen electrical contractors of Springfield, Mass., have joined in a special campaign for house wiring, continuing from April 15 to June 1. Between these dates the contractors will wire existing houses on streets having electric service, on payment of 10 per cent of the contract price at the completion of the work and 10 per cent a month until full payment is made.

The United Electric Light Company joins the contractors in announcing the special offer on which the various parties have agreed, naming the concerns who will do the work. Negotiations are to be carried on between the contractor and the householder, the central station not participating in the contract.

DIRECT-CURRENT ARMATURE-WINDING TROUBLES.

By T. Schutter.

In direct-current armature windings there are certain troubles which are likely to happen, either through carelessness of the winder, accident, or defects in the material; the

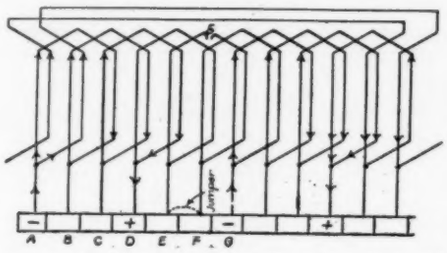


Fig. 1.—Lap Winding With Open-Circuited Coil.

latter should, of course, be detected by the winder. All these troubles which are likely to arise show up in various ways and, if taken care of at once, nothing serious will result, but if the machine is allowed to run, the winding may burn out, also ruin the commutator.

The troubles of a direct-current armature winding are as follows: open circuit, short circuit in a coil or between two or more coils, ground, reversed or cross-connected coil. The above-mentioned troubles will be defined separately, and a practical method for remedying each case will be explained. It might be stated that while these troubles appear in the same manner in both lap and wave windings, their repairs are made differently.

An open circuit is the most frequent trouble which arises and it may be caused in many ways. The leads from the coils may be broken from the commutator, which is caused by poor soldering or carelessness when being connected. When the leads from the coils are being connected to the commutator they should never be pulled down very tight, because when the leads heat up they expand and when they cool they contract; if the cooling is quicker than that of the underlying core, the contraction will be greater than that of the core and the leads will stretch, which in course of time will cause the leads to break off and the winding will be open-circuited.

The proper way to connect leads to the commutator is to allow them to be slack, and when all the leads are connected a light string band is put on to prevent the leads from rising up due to the centrifugal force when the machine is running.

If the machine should run very hot and begin to throw the solder from the commutator, this may cause poor contact between the leads and the commutator bars which will also give the winding the appearance of an open circuit. This style of open circuit can be very easily repaired by resoldering the leads in the commutator.

The action of an armature with an open circuit is that there will be violent sparking at the brushes; the spark will be of a greenish color and have a tendency to follow from one brush to another in the running direction.

If an armature is run only a few moments after the violent sparking has begun, it would be hardly possible to locate the point of trouble by inspection, but if run for some time, the bars to which the open-circuited coil or coils are connected will be burnt and pitted, also the mica between the bars to which the open-circuited coil is connected will be blackened and the surface carbonized.

Should the sparking only occur when starting and then disappear, or occur at intervals of short duration and then disappear again while the machine is in motion, this is called a flying open, and is one of the worst troubles to locate.

When an open circuit appears, the machine should be shut down at once and the trouble located. If it is not possible to locate the defect by inspection and no handy arrangement for testing is available examine the winding for broken wires. First examine the leads connecting to the commutator to see whether any are loose or broken away from the bars due to contraction; if these are intact, examine the back end winding and see whether any of the coils are broken due to accident; if these also are intact, then examine all other parts of the winding which are exposed. If no broken wires are found, then the armature should be taken out of the frame and tested to locate the open-circuited coil.

To test an armature there are two practical shop methods that can be used. One is the use of a test lamp and the other is the drop-of-potential method.

The lamp is only practical on high-resistance windings, while the drop-of-potential test is practical on any winding by varying the value of the current used for testing.

In lap or parallel winding one open-circuited coil will show up in but one place on the commutator, while in a series or wave winding it would show up as many times as there are coils in series between adjacent commutator bars. (The number of coils in series between adjacent commutator bars in a series winding equals half the number of poles, thus in a four-pole winding there will be two coils, and in a six-pole winding there will be three coils in series between adjacent commutator bars.)

The Figs. 1 and 2 are simple diagrams of a lap and a wave winding. In Fig. 1 coil 5 is open-circuited, and in Fig. 2 coil 2 is open-circuited. Fig. 2 is a four-pole series winding and there will be two coils in series between adjacent commutator bars.

Assume that Fig. 1 is a high-resistance winding, and we are using a test lamp to locate the trouble. First remove the armature from the frame, and with the leads of the test lamp test between bars *A* and *B*, as the coil connected to these bars is a good one; the lamp will light, but not as brightly as it would across the line, since the resistance of the coil is in series with it. The same result will be obtained between bars *B* and *C*, *C* and *D*, *D* and *E*, but between bars *E* and *F* the lamp will burn very dim, as at this point the open-circuited coil is connected and the resistance of the entire winding minus one coil is in series with the lamp. The same thing will occur between bars *A* and *B* in Fig. 2, as one of the two coils which are in series between these two bars is open-circuited. If there were more than one open circuit in either winding, the lamp would go out when the defective points are reached.

If the windings were of low resistance, it would be almost impossible to locate the open circuits with a test lamp, and in this case the drop-of-potential method would be the best and

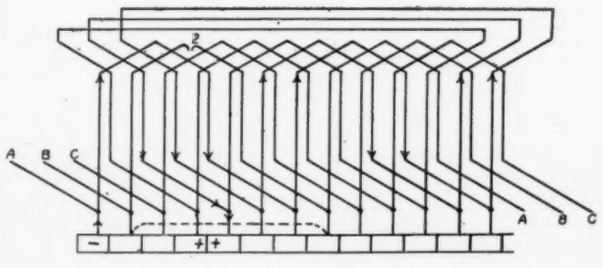


Fig. 2.—Diagram of a Wave Winding—Coil 2 is Open-Circuited.

most accurate. Fig. 3 shows a simple arrangement for the drop-of-potential test.

L are lamps to regulate the test current.

S_1, S_2, S_3 are switches to control the lamps.

VM is a low-reading voltmeter which indicates the drop in potential.

AC are the armature contacts which are set on the commutator in the same position as the brushes would be on a two-pole machine (diametrically opposite).

VL are terminals to which the voltmeter leads are connected to take the readings between bars.

By setting contacts *AC* on the commutator, as shown in Fig.

4, and regulating the current so as to get a reading at about the center of the scale from a perfect coil, the drop across a good coil will be equal to I×R; assuming that I=2 amperes and R=0.5 ohm, then the drop will be 2×0.5=1 volt. When all coils between the points *A* and *A'* have been tested, give the armature a half turn; this will bring *A'* to *A*, and *A* to *A'*, then proceed to test as before. In this section there will be no reading on the voltmeter, as there is no current flowing, until bars *B* and *C* are reached. At this point the needle of the meter will be thrown across the full scale very violently, as the full voltage applied to the armature is recorded at this point. This test applies to both a lap and a wave winding.

To repair this defect, first examine the winding as previously explained. If no broken wires are found, and it is impossible to open up the armature to replace or to repair the winding at once, an emergency or temporary repair can be made, by taking the leads of the open-circuited coil from the commutator, and soldering a jumper across the bars, as shown in Fig. 1 for a lap winding and as shown by dotted line in Fig. 2 for a wave winding. It is not advisable to cut out too many coils in a winding, and all defective ones should be repaired or replaced at the first opportunity.

It must be remembered that the connections between the coils and the commutator bars are not made in the same manner in lap and wave windings. In lap windings opposite ends of the same coil are connected to adjacent commutator bars, but in wave windings opposite ends of the same coil are connected

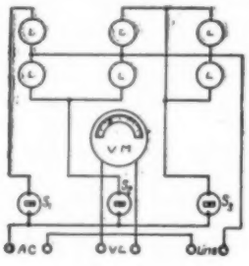


Fig. 3.

Fig. 4.

a certain number of commutator bars apart; this will depend upon the coil and commutator pitch (see Fig. 1 and 2).

A short circuit in one coil or between two or more coils is caused by defective insulation or carelessness in winding. In windings where there are two or more coils in the same slot, a strip of insulation should be placed between them, also a piece of very thin insulation between the coils at the end windings where they cross one another.

An armature with a short-circuited coil or coils, when used in a motor, will usually fail to start on the first few points of the starter, and when running it will not run with an even, steady motion, but will run in a jerky manner. The cause of this is that when the short-circuited coils come under the pole they will have a tendency to reverse the direction of motion, but the momentum keeps the armature going in the same direction.

In lap and wave-wound armatures the tests for a short circuit in one coil are made in the same way, that is, by using the drop-of-potential method as described for an open circuit, only when the short-circuited coil is reached the drop will be less than in a perfect coil, because its resistance will be less.

There is no practical way to remedy a short-circuited coil unless the short can be cleared. If this is impossible and the machine cannot be shut down to permit replacing the defective coil, take the leads of this coil off the commutator and then cut a piece out of the coil, that is, cut a piece out of every turn of wire which composes the coil. Then solder a jumper across the commutator bars from which the leads have been taken as has been explained for an open circuit.

To test for a short circuit between two or more coils which cannot be located in any other way, a test lamp is the most convenient and accurate method. First disconnect all the coils from the commutator, also one coil from another; then connect one end of the test lamp to the beginning of any coil permanently and call it No. 1; with the other end of the test lamp test two or three successive coils to see whether they are shorted with No. 1; if the lamp will not light from any other end except the end of the first coil, splice this end to the beginning of the second and proceed to test as before.

In Fig. 5, coils 2 and 5 are short-circuited together. This being the case, the test lamp will light when the leads are connected to points *A* and *E*, with the leads of coils 3 and 4 still disconnected. If the short cannot be cleared, the armature

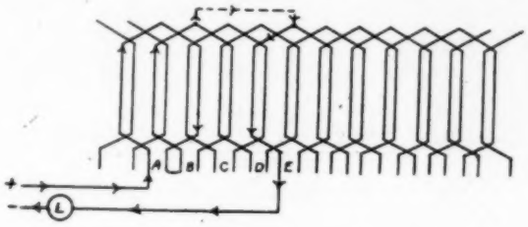


Fig. 5.—Coils 2 and 5 Are Shown Short-Circuited.

must be rewound if hand wound, or the coils replaced by good ones if form wound. This is the only remedy.

A ground is also caused by defective insulation, which will allow the winding to come in contact with the core, shaft or other metal parts.

To test for a ground the test lamp or the drop-of-potential method can be used. If using the test lamp, take the leads out of the bars each quarter way around the commutator; to locate the section in which the ground exists put one end of the test lamp on the shaft and with the other end test to each quarter. The lamp will light only between the shaft and the section in which the grounded coil is located. Then divide this section into smaller parts and test until the grounded coil is finally located.

When the drop-of-potential test is used, apply the leads *AC* (Fig. 3) to the commutator as explained; fasten one of the voltmeter leads to the shaft of the armature, and with the other lead test to all bars. The bar or bars from which you get the lowest or no reading are the ones to which the grounded coil or coils are connected. This test applies to both lap and wave windings, and the only remedy, if the ground cannot be located, is to rewind.

Reversed or cross-connected coils are coils with their leads crossed. In Fig. 6 a section of a winding is shown with a coil reversed. The action of the armature with such a defect will be the same as that of a short circuit. To locate this defect

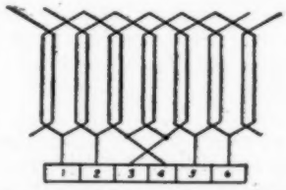


Fig. 6.—Winding With Cross-Connected Coil.

use the drop-of-potential test. Place leads *AC* (Fig. 3) on commutator, and with the voltmeter leads test between adjoining bars. The reading between bars 2 and 3 will be twice that of any other normal pair of bars; between bars 3 and 4 the reading on the voltmeter will be reversed; between bars 4 and 5 there will be another double reading. It will be seen that between bars 2 and 3, also between bars 4 and 5 there are two coils in series. To remedy this defect, take the leads from bar 4 and put them on bar 3, and the leads from bar 3 and put them on bar 4.

These methods of testing direct-current armature windings and making their repairs are practical in every way, and by following the instructions, which are very simple, they will never fail.

Proper Handling of Accounts Payable

By George W. Hill

This article is the seventh of the present series on business and accounting methods for electrical contractors. Mr. Hill describes in this article a convenient and systematized method for handling accounts payable and shows how this fits into the general accounting system which he recommends. The value of such a system in giving a firm a proper credit standing is pointed out.

Owing to the peculiar character of the Accounts Payable account, and lack of uniformity in form, size and shape of the various invoices received from the numerous concerns with whom we do business, each concern using invoices adaptable to its own system of handling accounts, there seems to be a demend for some method which will in a large measure not only provide a file or reference binder but a complete and comprehensive record of invoices.

There are as many methods of handling the Accounts Payable account as there are concerns in business, and the old form of bookkeeping seems to prevail in many offices which carries with it the idea of filing the invoices separate and apart from the actual records, and the device as shown in the accompanying illustration is presented in the hope that it may prove a convenience to those who desire to keep close tab on their Accounts Payable account. This simple method will draw the various accounts together, and show at a glance the true condition of the entire account, as well as provide a ready reference and record of all the individual accounts. There is a disposition on the part of many, in an effort to eliminate as much detail as possible, to let the other fellow keep the books, but this is commendable only so far as it will prove efficient in our own office. Many concerns are not carrying their Accounts Payable account through their books, but simply using files for invoices and transferring them from unpaid to paid binders and considering the amount of unpaid as their total accounts payable in taking a financial statement, which is often delayed until the end of the fiscal year. Many discrepancies creep in during the year and often misunderstandings and disputes arise, which are settled with more or less difficulty and in some cases with the disastrous result of severing what might otherwise be pleasant and mutually profitable business arrangements.

In order to not only provide a convenient file but a complete and comprehensive record of this very important account in all business, the writer has designed a large manilla envelope, on the front of which is ruled and printed that which might be called a "Settlement Sheet," space being provided at the top to contain the name of the creditor as well as such other general information as might seem necessary, and from left to right it will be observed the columns are provided for the records. Column 50 is for the date. Column 51 for any explanation thought necessary, such as due and discount dates, special arrangements, etc. Column 52 is invoice number, Column 53B discount taken in settlement of account or individual invoice, Column 54 amount of payment made on account, Column 55 amout of invoice, balance column for the purpose of carrying the balance due. It will be seen that by simply adding the amounts represented in the balance column the total of accounts payable is ascertained.

From this record an absolute proof of the Accounts Payable account may be had, as the previous accounts payable plus the purchases (Column 55) minus the total of Columns 53B and 54 will represent the total accounts payable, as shown from the total of all balance columns. This is a simple operation and is accomplished with little difficulty where an adding machine is in use in the office.

These envelopes are 12 by 9.5 inches in size and will contain conveniently any sized invoice which may be received, together with other memoranda which may seem desirable to file with the account. These envelopes may be placed in standard vertical files, alphabetically and will prove a very convenient and compact record.

It often becomes necessary to make a close investigation of one particular account, and by simply going to the filing case the record of all invoices and documents are found within the envelope which may be lifted from the file and taken to the desk of the bookkeeper or elsewhere and a thorough investigation made with all records and documents before you. The entire account may be checked up. Such a record seems very essential as the jobbers and manufacturers are becoming more strict with their customers and many are refusing to extend credit to those whose methods of handling accounts are such that unpleasantness and misunderstandings are continually arising and from whom it is impossible to secure a comprehensive statement of their standing in the business world.

SETTLEMENT SHEET

CREDITOR The American Co DEPT.

ADDRESS Chicago Ills

50 DATE		51 EXPLANATION	52 INVOICE	53 B DISCOUNT	54 DR.	55 CR.	BALANCE
		FORWARD					
Mch	3		682			200 00	200 00
"	10		736			167 00	367 00
"	15		892			70 00	437 00
"	30		682	10 00	190 00		237 00

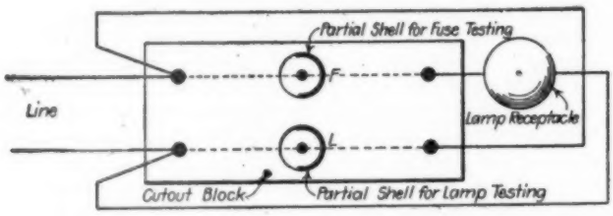
Settlement Sheet for Electrical Contractors' Accounts.

DOLLAR WIRING KINKS

Every reader is invited to contribute to this page. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Fuse and Lamp-Testing Block.

A cutout block can be made into a convenient fuse and lamp testing set by widening the screw shell on the cutout so that a fuse plug or lamp can be slipped in, thus saving time as it will obviate screwing the plug or lamp in. Cut a part of the



Handy Fuse and Lamp-Testing Device.

screw shell off which will simplify it a little. Then take a lamp receptacle and connect it as shown in diagram. This lamp will burn when fuse plug is good.

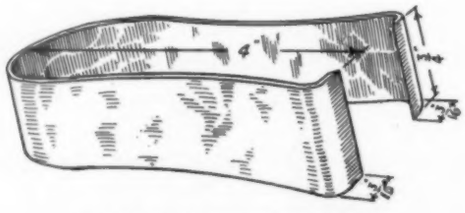
Benjamin Swanson.

Fishing Wire in Fixtures.

We have had excellent results in wiring bent fixture arms by using a piece of wire solder about one-eighth inch long and cutting about half way into it with a knife and pressing this on a strong linen thread or string. The weight of the solder will pull string through fixture easily, if held properly and tapped gently. In larger fixtures a larger piece of solder doubled and clamped on the string with pliers will be found useful. O. B. Welch.

Convenient Wire Scraper.

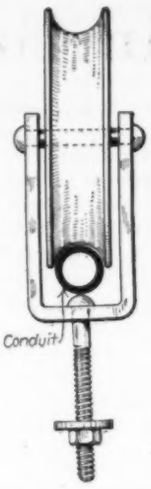
A handy wire scraper for skinning lamp cord, magnet wire and other small wires can be made from an old hack saw of a power machine. Take a piece about 10 inches long and grind off the teeth. It is then bent into shape as per sketch and the two lips ground to a level to form a



Simple Home-Made Wire Scraper.

cutting edge. By placing the wire between the edges and pressing the scraper together the wire can be easily cleaned of insulation by pulling the scraper over the wire. If an old saw blade cannot be obtained, a piece of phosphor bronze, 10 inches long and 0.75 inch wide and one-sixteenth inch thick can be used, although the cutting edge will not hold as well. However, the writer has one made of this material which has been in service a number of years.

F. A. Grohsmeyer.



Conduit Bender.

Simple Device for Bending Conduit.

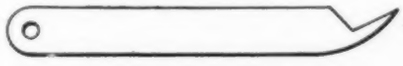
A simple and cheap fitting for bending fairly large conduits can be made by taking a piece of one-half-by two-inch strap iron and bending it into the U-shape shown in the sketch. Then drill through it three holes, two for a pin to hold a grooved pulley wheel and the third for a stout bolt. The pulley should be about 8 by 2.5 inches and can be bought cheaply at most any foundry or machinery supply shop. Next bore a hole through a post, a heavy plank or the floor, and fasten the outfit by putting the bolt through the hole and drawing up the nut and washer tightly.

By putting the conduit through as shown, a very nice bend can be quickly made. This outfit can be used for all the sizes of conduit that fit well within the groove of the pulley used. Its use is especially convenient and desirable on a large job where a great deal of conduit has to be bent.

Walter Morris.

Handy Tool for Commutator Repairs.

While out on a job recently it was necessary to repair a short-circuited commutator. A knife was not handy to dig out the mica between the segments, and to go behind the commutator. I found an old hack-saw blade and ground it on an emery wheel into the shape shown in the sketch. With the



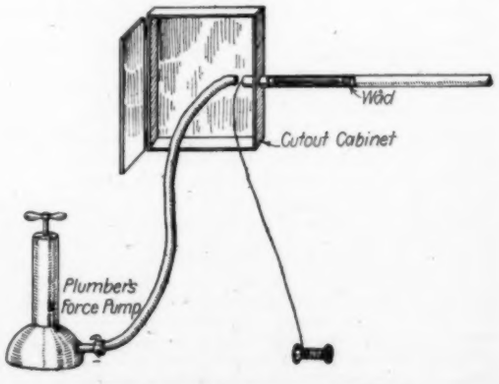
Tool for Commutator Work.

point I scratched till I had a start in the mica. The rounded end served as a lever, while the point dug out all the bad mica. I found this a very handy tool for all commutator work, especially the taking out of short-circuits in a commutator.

J. Wagner.

Fishing Conduit Runs by Air Pressure.

In a recent issue a contributor gave his idea of fishing hard conduit runs by means of a vacuum cleaner, using the suction of the machine to pull a cord through. The following method has been used by me a number of times when every other method had failed. It is especially useful in new buildings. The scheme is shown in the sketch herewith. You can nearly always obtain use of a plumber's force pump on a new building. Put in as much strong thread as possible with a round piece of cloth or wad acting as a carrier. Apply end of hose to conduit opening. At every operation of the pump you will find the thread advanced about three feet. M. Podell.



Conduit Fishing by Air Pressure.

THE DEALER AND STOREKEEPER

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-Keeping for the Dealer in Electrical Goods

SOWING THE SEED FOR INTENSIVE CULTIVATION IN MERCHANDISING.

Business-Building Suggestions to the Electrical Dealer for Securing the Best Publicity.

By W. B. Parker.

This is the second of a series of articles describing practical methods the electrical dealer can make use of in the work of business building. The writer believes many men are unnecessarily limiting themselves as to the extent of territory in which they reach out for new business and others are not getting the results they should, even in the limited territory they are attempting to cover.

Following the conclusion reached in the previous article that newspaper and direct mail advertising were the only methods of publicity worth considering as sure producers of new business, we will now take up the matter of newspaper space and the kind of copy it should be filled with. It is not so important that a large space should be contracted for as that some space should be used regularly and that the copy should be changed at least weekly. Where such an arrangement is possible, it is best to reserve space on a particular page, so that readers will always find it in the same place and will come to look for it there. As small a space as seven inches can be used very effectively if it really contains news. Three insertions weekly, where a daily is used, will be found almost as resultful as daily insertions.

Advertisements are primarily store news and will be considered as such and read as carefully as any other part of the paper if the dealer does his part in editing them and making them interesting. The writer advises two styles of advertisements to be used alternately. One mentioning specific articles and naming prices and the other emphasizing the service offered to patrons. You can not emphasize service too much—and by service is meant your desire and ability to give entire satisfaction. Once convinced that he can place absolute confidence in your statements about any goods you handle and you have gone a long way towards making a permanent customer. He will not be so likely to allow cut-price offers of others whose reliability he does not feel so sure of to tempt him to take the chance of inferior goods. Where as small a space as seven inches is used there is, of course, not much room for display, but the head line should be in fairly good sized black-face type, as should the signature at the bottom. The smaller light-face type would be suitable for the body of the advertisement. It is a very good plan to have a distinctive signature engraved, and use it as a kind of trade mark in all newspaper advertising.

Next comes the matter of direct mail advertising. To obtain the most business possible in a given territory letters must be used. And the right kind of letters are not at all expensive, for they produce a greater volume of immediate returns than any other form of advertising, and this is true even where the persons receiving the letter live near the sender's place of business and are personal acquaintances. People like to feel that they are considered such desirable customers that this special effort is made to get their business. Such letters should have one or two objects in view—either the making of a special, time-limited offer on certain merchandise or should emphasize the service offered patrons at all times, with special mention of some particular article.

General letters merely inviting the recipients to trade with the dealer sending them, are not effective, at least as to early results, and should be avoided. Following is a sample of a service letter with a particular item mentioned. It has the elements of a successful sales letter,

Dear Mr. Smith:

When you spend your good money for electrical work or supplies you want to feel sure of securing full value. You want to know that should anything go wrong it will be promptly made right

That is exactly the kind of service we offer you. With us no deal is complete until the customer is satisfied. It's the modern way of doing business and it is the only way that is really worth while

This matter of service is one we want to emphasize. While we keep nothing we cannot honestly indorse, yet it often happens that an article that is good under some circumstances is not so suitable under others. We always stand ready to give you the benefit of our expert knowledge and unbiased opinion

Just now we offer a special inducement in a six-pound Electric Iron, complete with cord, plug and stand, at only $2.50. This is only one of a number of items that are of more than ordinary interest to the careful buyer

Whether intending to purchase or not, you are extended a cordial invitation to inspect our display during the coming week. You will be certain to be interested in the latest products of the electrical industry we are now showing

Yours very truly,

DEALER & COMPANY.

A Business-Producing Letter.

first, because it is so short that it is easily read and remembered; second, the first paragraph indicates financial benefit to the reader; third, the special item mentioned gives the reader a particular offer to consider at the time, and fourth, because the closing paragraph suggests a reason for calling even if not ready to decide on buying anything.

Much attention should be paid to the appearance of all letters sent out. It pays to use a good quality of paper and to see that the general appearance is good. They should be printed in imitation of typewriting through a silk ribbon, as is done on the multigraph and similar machines, although the work can be done on an ordinary printing press if the printer understands the process. A blue or purple ribbon usually gives good results and if a typewriter is convenient the letters should be filled in with the name of the recipient, as indicated in the sample. Otherwise, the salutation may simply be "Dear Friend" and printed with the balance of the letter. Each paragraph should be indented and spaced so that it stands out clearly. All letters should be signed with pen.

A System of Dividend Coupons for Electrical Merchandising.

A new plan in connection with the sale of current-consuming devices is being followed by the Commonwealth Edison Company, of Chicago, Ill. It consists in

Cover of Premium Booklet Used by Chicago Company.

arranging with merchants throughout the company's territory to give out to their customers with each purchase Federal dividend coupons, which are furnished by the Federal Profit Sharing Company, a company closely associated with the Federal Sign System (Electric). Merchants cannot take advantage of the plan unless they used a Federal sign on Commonwealth Edison service.

The coupons are of the five-cent denomination and are redeemable at the company's Adams Street Electric Shop, being accepted in exchange for any current-consuming device. Coupon books are obtainable from any of the merchants, each book holding 960 of them. Once a month the holder of a book may secure 20 coupons free by merely presenting the book at the company's office. The coupons are non-transferable, so that even if a collector has a number of books it will not be possible to fill up one with free coupons.

The redemption value of the coupons is based on the wholesale price of the electrical merchandise and is, therefore, considerable higher than other systems of its kind. The cost of the Federal coupon to the merchant who gives them to his customers will be actually 25 per cent less than the cost of other stamps.

The Federal Profit Sharing Company is the organizer of the movement. This concern will sell to central stations throughout the country, urging the benefits to the central-station company by increased attendance at electric shops, increased interest on the part of consumers of current, increased consumption of current by the use of the devices used as premiums, and increased good will for the central-station companies promoting the plan in each community.

The coupon book is not merely a blank book for holding coupons, but also a very attractive catalog of a great many of the devices used as premiums. It cannot help but greatly stimulate interest in the plan.

Electric Washing Machines and Ranges Featured During Clean-Up Week.

The Gainaday electric washing machine was featured in the appliance department of the Boston Edison Company during clean-up week. A demonstrator operated one of the machines in the show window. The electric range was also an attractive exhibit, with a conspicuous placard announcing that for $10 a range would be installed in the home of any customer of Edison light.

Combining Facilities and Service Policies to Secure Quality of Service.

Trade should be founded on service. Furnishing merchandise is a service, the quality of which depends on the facilities and policies of an organization. The firm handicapped by lack of facilities may be in a position to furnish a high degree of service because its policies towards its customers are such that a high standard of "willingness to serve" is maintained. By adding adequate facilities to this quality a business enterprise has the very best means for the conduct of trade.

These points are illustrated by the new fixture room recently installed by the Northwestern Electric Equipment Company, of St. Paul, Minn. This room is maintained for the use of the company's customers, who are given the liberty of bringing in their trade and selling the fixtures from the floor, or customers may send their trade in with letters of introduction, the company makes the sale and credits the merchant in the locality from which the purchaser comes.

The stock of fixtures is kept very complete, and the company tries to make the room one of the most attractive of its kind in that section of the country. The wall cases, which run the entire length of the room, are wired for lamps, and the ceiling and portable fixtures can be lighted at will for display purposes. The ceiling fixtures are controlled in rows with three-way switches

New Display Room of Northwestern Electric Equipment Company.

and the wiring is arranged so one-half of the fixtures on each row are lighted at the same time, giving an opportunity for comparison with the remaining fixtures in the row.

Statistics on the Growth of the New York Telephone Company.—Statistics prepared by F. H. Bethell, vice-president of the New York Telephone Company, indicate the surprising growth of this public utility. The New York Telephone Company gained more than 91,000 telephones last year in New York state and northern New Jersey. It now serves 1,246,000 users of telephones and averages 5,000,000 calls daily. There are now 622,000 telephones in New York City.

QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be submitted preferably within eight days of the date of publication of the question and should be limited, if possible, to not over 300 words. Payment will be made for all answers published.

Questions.

No. 342.—Trouble Finders.—Please have some one among the questions and answers contributors explain for me the principles on which the wireless electrical pipe and trouble finders are built and operated. Please show by simple diagrams the methods of wiring used in both the exploring coil and wave transmitter.—F. A. B., St. Joseph, Mich.

No. 344.—Life of Gas-Filled Lamps at Various Voltages.—What is the rated life of 110-volt Mazda "C" lamps at rated voltage and at voltages two per cent above and below rated voltage? If available, kindly give data on the life at various voltages ranging both ways from 110 volts up to eight per cent.—R. D., Washington, D. C.

No. 346.—Electric Arc for Cutting Scrap Metal.—What voltage should be used in cutting up old boilers with an electric arc? Of what material and shape should the electrode be? What safety device is most practical for preventing overloading transformers used in such work?—L. G. C., Lincoln, Neb.

Answers.

No. 340.—Three-Phase Versus Single-Phase Transformers.—If the three-phase transformer actually possesses all the advantages that are claimed for it, why is the three-phase distributing transformer not used instead of the single-phase on a larger scale? How do the two compare as regards reliability and cost?—N. T., Chicago, Ill.

The single-phase distributing transformer has given good satisfaction for general distribution work. The advantages of the three-phase unit are often more than counteracted by the disadvantages. Single-phase transformers are more flexible than are the three-phase type. For loads up to about 25 kilovolt-amperes two transformers can often be used instead of three without causing any serious unbalance of voltage or current. Lighting and power are usually supplied by the same circuit, hence for this reason alone single-phase units are required in any case, and by adhering to the single-phase transformer the number of different sizes and the total number of transformers that must be kept in stock may be greatly reduced, while the amount of reserve capacity on hand ready for emergency is considerably greater for the same investment. If one single-phase transformer is in trouble it rarely affects the other units in the same bank, and the time of service derangement is a minimum, due to the smaller amount of work necessary in replacing the damaged unit, while frequently the two remaining transformers may be made to carry the load, or at least partial load, until the defective unit has been replaced. On the other hand, damage to one phase of a three-phase transformer usually affects at least one of the other phases, which means that the cost of repairing will be greater, also the loss of time in restoring normal service, not to consider the extra expense of replacing the transforming apparatus of all three phases, whereas the replacement of one would ordinarily suffice.

The chief disadvantage of the three-phase transformer, and the one which is largely responsible for its lower cost per unit of capacity, is the dependence of one phase upon another through the magnetic circuit, while the high cost of maintaining reserve capacity is also a factor. Pole-type transformers are subject to greater hazards from storms, lightning, etc., than are transformers of the indoor type, and for this reason alone the single-phase transformer is quite often given preference over the three-phase, because, although the first and installation costs are in favor of the latter, the operating cost is in favor of the former. In vaults and industrial substations under cover, the case is different; the hazards are less, and here the advantages of the three-phase distributing transformer may outweigh the disadvantages, in that it enables lower initial and installation costs, permits the use of smaller buildings, etc. On the other hand, one single-phase transformer may be ample reserve capacity for a bank of three single-phase units, whereas one three-phase reserve unit would be needed for a three-phase transformer.

Where poles are jointly used by two or more companies the matter of space economy is very important, and here the three-phase transformer is at a very great advantage. Again, in underground distribution, where the load density is high and conditions congested, a condition that will become worse as underground distribution comes into more universal application, the three-phase transformer offers about the only suitable solution.

The writer thinks it doubtful whether the three-phase distributing transformer will find very general application in place of the single-phase unit in this country, except as stated above, and for serving sparsely populated districts where lightning is not severe, and for supplying small three-phase loads with little lighting, such as is the condition at many irrigating plants, oil wells and similar purposes, where the three-phase unit enables the initial investment to be kept down, in this way permitting immediate returns upon the investment. The three-phase distributing transformer has its sphere, but it is a narrower one than that of the single-phase type. This opinion is unbiased, and will be found to be that of many central-station companies who have given this matter careful deliberation. —K. R., Chicago, Ill.

No. 341.—Controller for Bascule Bridge.—A bridge-machinery designer has told me that it is impracticable to introduce any automatic control features for the motors operating bascule bridges because of the variable load due to wind, sleet, etc. Have any bridges of this type ever been equipped with automatic controllers, or at least automatic limit switches to prevent smashing or upsetting the bridge leaves or breaking the machinery from running too far?—W. W. G., Wilmette, Ill.

To the writer's knowledge there is now in successful operation a magnetic switch controller, fully automatic in every respect, operating a motor-driven lift bridge, the motors being of direct-current type. Describing it briefly, the controller consists of shunt-wound magnetic contactors of necessary size, main-line knife switch, overload relays, and current-limit relays. All of these parts are mounted on individual slate panels with busbar wiring in the rear. Further, the apparatus consists of separate cast grid resistances, a comparatively small master controller for the operator, and necessary automatic limit switches. As explained above, the control equipment is entirely automatic. The operator can throw the master controller from "off" position to full "on" position, and the control board takes care of the bridge, including slow down and final stop. In this particular instance three limit switches are used. The first limit switch opens all of the magnetic switches and inserts the starting resistance, which lessens the motor speed; the second limit switch shunts the motor armature, further lessening the speed, and this point of slow down can be adjusted to suit any given condition of load; the final limit switch automatically cuts the motor off the line, and then shunt-wound electric brakes are set, thus definitely stopping the bridge at the desired point.

The writer realizes that a lift bridge is not a bascule bridge, but can see no possible trouble in building a similar magnetic switch controller for a bridge of the latter type. As far as the varying load is concerned, automatic magnetic switch controllers have been built for several years to operate blast-furnace skip hoists, and in such installations the same bucket or skip will at one trip carry up a load of coke, at another trip will carry up a load of limestone, and at another time will carry up a load of ore, and among these three materials you will find a wide variation in weight for the same volume, and therefore a

difference in load. The same controller can be built to hoist these loads, and have a stopping point for the skip which will not vary over one-half inch for any of the loads.

Such a small variation in stopping point, with such a wide variation in load indicates definitely that a bascule bridge could be handled by an automatic controller and limit switches, so set that they would not only prevent smashing or upsetting the bridge leaves, but would always stop the bridge in exactly the proper position. As a matter of fact, investigation will show that bridge engineers provide limit switches at the upper and lower limits for preventing overtravel of the mechanism, even when using manually operated controllers.—W. H. W., Chicago, Ill.

No. 343.—Theater Emergency Lights.—Rule 38*a* of the National Electrical Code provides that "where supply to a theater cannot be obtained from two separate sources, the feed for emergency lights must be taken from a point on the street side of main service fuses." Has this provision been found ample for the purpose? Would it not be desirable to insist on an entirely independent source, such as a storage battery?—J. H. R., Pittsburgh, Pa.

The object of the rule in regard to theater lights is obviously to provide light in case of emergency when the regular theater lights are off, so as to enable the audience to leave quietly and without danger of panic. If the main lights are off for only a short time, these emergency lights can be used until the circuit is again established. It would seem to the writer that it would be well in that case to have the emergency circuit taken from the street side of the main circuit fuses. Owing to an unusually heavy theater load or some accident, the inside fuses might blow. The outside emergency circuit could be thrown on until the fuses were replaced. Sometimes, however, a generator goes wrong in the power house, or a main feeder blows up, in which case obviously the outside circuit would be useless and, if the lights suddenly went out for some such cause, there is always the danger of a panic, resulting in possible loss of life. While the writer has never heard of any great catastrophe happening on account of just such an accident, the possibility should not be overlooked and provided for.

As an independent source of electric light there are two commercial possibilities—dry cells and storage batteries. There is on the market an arrangement of dry batteries known as a multiple battery in which five dry cells are connected in series and three such sets in multiple. Such a battery is fully capable of operating six six-volt two-candlepower miniature incandescent lamps for half an hour or more, which will give sufficient light to effectually prevent any panic in leaving a small theater, such as the usual motion-picture house. Dry cells are, however, subject to deterioration by long standing and the manufacturers are not willing to make any guarantee as to the length of time it is safe to keep one of these batteries. A test made for this specific purpose in the laboratory of one of the manufacturers has shown that at the end of a year the battery was capable of fulfilling the condition just imposed. The manufacturers recommend that when such a battery is used, it should be tested once every two months and they can assure the user that as long as a momentary test shows the battery to be in good condition it is safe to keep it in the circuit. For larger theaters the storage battery is probably the best solution. Even a small battery will be ample to supply sufficient current to light the lamps for the required length of time. The only trouble is that the battery must be regularly inspected, recharged every two or three months and kept filled with water to replace that lost by evaporation. In conclusion, the writer strongly believes that one of these two independent sources of current is necessary to prevent the possibility of a great catastrophe and the choice should be made according to the particular conditions involved.—V. A. C., Cleveland, O.

No. 345.—Demagnetizing Iron Castings.—How can magnetized iron and steel castings be readily demagnetized? We are experiencing a great deal of trouble with castings that have been magnetized by the lifting magnet in the foundry yard. When these castings are being machined, it is impossible to get the true size, inside or outside diameter, because of the magnetic attraction on the calipers. Some of our work is large and some quite small. An alternating-current demagnetizing coil would have to be too large and costly to be practicable. Is there no cheaper or easier way to demagnetize these castings?—J. B. K., Torrance, Cal.

Probably as practical a way as any to demagnetize a piece of iron without the use of alternating current is by means of heat. If the piece is considerably longer than it is wide, it would be well to hold it so that its length will be in an east-and-west direction. The process is simple and is easily accomplished, it being merely necessary to apply heat in any way until the piece approaches redness. This process can be hastened somewhat by pounding the iron with a hammer made of any nonmagnetic material, such as lead, brass, etc., at the same time as the heat is applied. Of course, the size and the nature of the work will determine the practicability of the above method.

The writer has also seen small pieces that have been slightly magnetized cleared of their magnetism by holding them in an east-and-west direction, at the same time pounding them with a hammer made of a nonmagnetic material. By testing with a compass at frequent intervals and continuing the process a point will be reached when it is found that neither end of the piece repels the compass needle, indicating that the piece is demagnetized. As mentioned above, this process is only useful when the amount of magnetism is very small. The above test for magnetism will also be found useful where heat is used as a demagnetizing agent.—A. B., Cleveland, O.

"Sociability Run" and Contest for Electric Cars to Be Held in New York.

Electric pleasure car owners in New York City will have a day of their own on May 19 when the New York Electric Vehicle Association's "sociability run" will take place. The run is planned with the object of encouraging sociability among the hundred or more women drivers of electric automobiles in New York and of demonstrating the practicability of the electric car for long runs.

The start will be made at 2:30 p. m. from the Electric Garage, Central Park West and Sixty-second Street, proceeding up Riverside Drive, through Van Cortlandt Park and Westchester to the Siwanoy Country Club, Bronxville. Invitations are being sent by the New York Electric Vehicle Association to all owners of electric pleasure cars in Manhattan and the Bronx.

One of the features of the run will be a competition in the form of a secret time contest. The distance to be covered is approximately forty miles. Three judges will make the run in their own cars before the day of the contest, each one noting the total time in which he made the run. The average of these records will be obtained and will be used as the secret time for the run. The contestant coming nearest to driving her car over the route in the secret time will be awarded a prize. All that the contestants have to gauge their time by is the approximate speed in miles per hour which they are told to make.

Students of Ohio State University Hold Successful Electrical Show.

Students of the electrical engineering department of the Ohio State University, Columbus, held their third electrical show April 27-29. The exhibits and the number of visitors were such as to make the affair a complete success.

Among the distinctive attractions were two of Columbus origin, one an exhibition by the Automatic Reclosing Circuit Breaker Company, which makes an appliance invented by a former student. It is said to be the only circuit-breaker that will close automatically after any abnormal cause. The other exhibit was that of the Electro-Pasteurized Milk Products Company, which takes credit of having the only process of the kind in existence.

BOOK REVIEWS

"Theoretical Elements of Electrical Engineering." Fourth edition, revised. By Charles Proteus Steinmetz. New York: McGraw-Hill Book Company, Incorporated. Cloth, 368 pages (5¾x9¼ inches), 194 illustrations. Supplied by Electrical Review Publishing Company, Inc. for $3.00.

This is the fourth revised edition of the well known book on electrical engineering by Dr. Steinmetz. Although the book when first published in 1898 immediately took a high rank, it has been improved and has increased in favor with each revision. In the present edition everything beyond the most fundamental principles of general theory and special apparatus has been withdrawn, and the theoretical elements of present-day engineering have been included. This process has prevented the increase in the size of the book and yet permitted the incorporation of much new material.

The subject matter of the book has been divided into two parts, General Theory and Special Apparatus. The first part is subdivided into 20 sections, each of which consists of the theoretical discussion of some magnetic or electric principle. To represent graphically some of the electrical quantities the author has adopted the crank diagram in conformity with the decision of the International Electrical Congress of Turin. This Dr. Steinmetz evidently does with reluctance for he still believes it is inferior to the polar diagram which he formerly used. The second part, which comprises about two-thirds of the book, is devoted to the discussion of electrical machinery under the heading "Special Apparatus."

The reviewer has always been a great admirer of Dr. Steinmetz's writings, but his admiration has always been tinged with disappointment because his textbooks were not used as widely as their merit warranted, and as the pre-eminence and scholarship of their author justified. It is a regrettable fact that instructors and students shun the use of these books. The inherent difficulty of the subject is not always the sole reason for this avoidance, for very few persons can make a difficult electrical problem or phenomenon more clear to the understanding than Dr. Steinmetz, but many feel that the method of attack employed by the author is usually from the most difficult angle; or to put it in another way, that the more difficult and unfamiliar aspect of the subject is first presented.

This difficulty is illustrated in the present text in the discussion of inductance on page 21. The student learns in his study of elementary principles that self-induction and mutual induction are co-ordinate terms and that each expresses one aspect of the general phenomenon of electromagnetic induction. When, however, he takes up the present text he finds that the author uses these terms in a slightly different sense. In fact the unusual use of the term self-inductance has lead the author himself into an inconsistency, for on pages 24 and 133 he uses self-inductance and inductance synonymously.

Some of the other definitions of fundamental electrical quantities, if not misleading, are at least difficult of apprehension. Thus on page 54, "a condenser is said to have unit capacity if unit current existing for one second produces unit difference of potential at its terminals." It is also regrettable that the author still defines a magnetic field as a field of force. The fact that magnetic intensity is measured in terms of the force exerted on a magnet pole does not make field intensity and force physically identical. It seems to the reviewer that the use of the term force in this connection leads to confusion instead of clarity.

One more example must suffice to illustrate the difficulty a student has in comprehending the author's definitions. On page 122, electrical apparatus is classified in accordance to the classification of the Standardization Rules of the American Institute of Electrical Engineers, but the definitions differ considerably. Thus synchronous machines are defined as follows: "*Synchronous Machines*, consisting of a unidirectional magnetic field and an armature revolving relatively to the magnetic field at a velocity synchronous with the frequency of the alternating-current circuit connected thereto." If the reader will compare this definition with that in the Standardization Rules he will at once appreciate the point raised.

It must not be understood that the reviewer considers these defects to be serious. The book is so excellent that one feels a little disappointed to find minor defects. One particularly valuable feature is the addition of many illustrative problems.

The treatment, in the main, is of course scholarly and thorough. Dr. Steinmetz's ability to use mathematics to elucidate difficult electrical phenomena is too well known to need mention. The book should find a more extended use in the class room than its predecessors, and no teacher can afford to be without it.

C. M. JANSKY.

"Test Methods for Steam Power Plants." By Edward H. Tenney. New York: D. Van Nostrand Company. Flexible imitation leather, 224 pages (5x7¼ inches), illustrated. Supplied by Electrical Review Publishing Company, Inc. for $2.50.

This book was written "to bring into one volume those methods of analysis which can be used to good advantage in the power plant and which will aid the power-station engineer in keeping costs of generation at the lowest figure." There are six chapters dealing with test methods for fuels, combustion, waters, boilers, prime movers and lubricants, followed by a form for reporting boiler tests and a set of values of properties of substances and constants.

The scope of the book is good and there are many good sections but it is regretted that in a number of places the author has forgotten that the man who will use the book does not have as much knowledge as the author and consequently the discussions are not complete enough. At other places the author has failed to state various precautions necessary in making tests or using apparatus.

The book has a good table of contents, list of illustrations, list of tables and an index. It is well printed and bound.

"Overhead Transmission Lines and Distributing Circuits: Their Design and Construction." By F. Kapper. Translated by P. R. Freidländer. New York: D. Van Nostrand Company. Cloth, 300 pages (7¼x9¾ inches), 297 illustrations. Supplied by Electrical Review Publishing Company, Inc. for $4.00.

There is a demand, in the transmission and distribution field, for a book containing the derivation and application of formulas necessary in designing and erecting a transmission line. Heretofore it has been necessary to go through a number of engineering books and juggle the various formulas into one applicable to the particular problem in question. Mr. Kapper's book seems to have satisfied this long felt want in that it puts a library of information on transmission and distribution engineering in one volume. He has very carefully collected data pertaining to transmission and also adjusted the various formulas so as to make them apply to the design of transmission lines. He has done this in such a clear and simple way, that only a knowledge of simple arithmetic is necessary in order to use the formula. Each problem is very carefully solved by means of the numerous practical examples.

The following subjects are treated very fully and comprehensively: Conductor Materials; Sags; Structures (Designed of Wood and Steel); Wood Preservatives (Copper Sulphate, Kyanizing and Creosoting); Insulator Hardware; Tower Foundations (Concrete and Back Fill); Conductor Arrangement; Ties and Splices; Erection (Procedure and Method); Overhead Distribution (House-top); Right of Way and Tools. All of the above subjects are so well indexed as to put them before one with the least possible effort.

M. H. WAGNER.

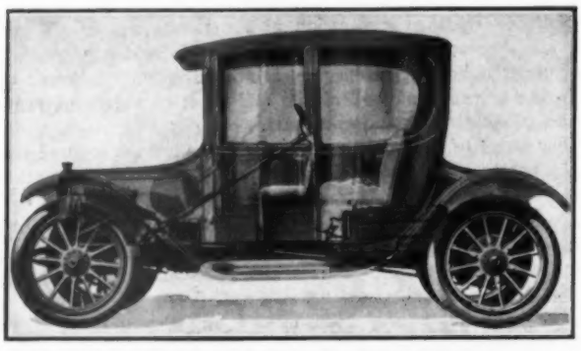
NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

Gasoline and Electricity Harnessed Together in Woods Dual-Power Car.

Some months ago the rumor of a self-charging electric startled the automobile industry. When this rumor was confirmed by the announcement of the Woods dual-power, or combination gasoline and electric car, great interest was aroused. While descriptions of this motor novelty have appeared, it is only recently that pictures have been obtainable.

The phantom view of the new car, shown herewith, has been supplied by the Woods Motor Vehicle Company, Chicago, Ill., to give a clear presentation of the construction,



Phantom View Showing Arrangement of Woods Dual-Power Car.

which is said to have developed unheard of and heretofore unbelievable efficiency and economy.

The power plant consists of a small gasoline engine and an electric motor-generator combined into one unit and mounted on a three-point suspension. The movement of a finger lever on the steering wheel connects the gasoline engine to the electric motor-generator, which cranks the engine and develops power that is transmitted through the armature shaft of the motor and propellor shaft direct to the rear axle.

The car starts as an electric by a simple movement of a finger-controlled lever on the steering wheel which operates the means for connecting the battery to the motor and increasing the speed as the lever is advanced.

At any advanced position of the electric lever the first movement of the finger-controlled gasoline lever instantly starts the gasoline motor. As this lever is moved forward, it causes the car to be operated more on the gas, and at a certain point it will run as a straight gasoline car, neither charging nor discharging the battery. With a slight variation of the relative position of the two levers on the steering wheel the battery may be either charged or discharged at will on any speed from ten miles an hour to 28 or 30 miles an hour. Electricity is generated and stored in the battery while the car is running.

At any speed above six miles per hour dynamic braking may be effected by retarding the electric lever. This causes the electric motor to run as an electric generator driven by the gasoline engine or by the momentum of the car. The power thus generated is used for charging the battery. The same effect may be obtained by a simple movement of the foot brake pedal, which also acts as a mechanical brake below six miles per hour.

Wonderful gasoline cars have been made and wonderful electrics have been made, but the credit of combining the two into one combination car must be awarded to the Woods engineers. This ingenious combination is said to create the most astonishing results. It is more than a gas car, more than an electric. It has the advantages of each and none of their disadvantages. It can be run as a gas car or as an electric. But when the combination of these two powers is used, then comes all that can ever be hoped for in an automobile—a self-charging, non-stalling, two-power car with unlimited mileage, adequate speed, and greatest economy.

The logical evolution of motor development embodied in this epoch-making two-power car is believed to mark a revolution in the automobile industry.

This dual-power car is described by its producers as having all the luxuriousness of the electrics that the Woods company has produced for nearly twenty years, plus unlimited mileage, 40 per cent greater speed, instantaneous acceleration, finger control of starting and stopping, maintenance lessened, efficiency and utility increased, outside charging plants eliminated, an enormous time saver—in other words, a two-power car with speed, power, simplicity, economy and efficiency, each in a degree never before possible in any type of automobile.

Improved Bell-Ringing Transformer.

The field of the bell-ringing transformer is constantly increasing. Formerly confined to stores, offices and large institutions, such as hotels and hospitals, it is now becoming a necessary equipment in all private homes. There is an increasing demand for a transformer perfectly

New Thordarson Bell-Ringing Transformer.

adapted for this purpose—high in output but low in price. This is the more difficult to satisfy, as the size of circuit varies with almost every installation.

To meet these varying conditions a new transformer has recently been devised by the Thordarson Electric

Manufacturing Company, Chicago, Ill. It overcomes the difficulty of varied current by substituting for a single secondary voltage three separate voltages, of 6, 8 and 14 volts. The installer can thus connect the bell circuit to whatever voltage it requires, without the repeated expense of buying larger transformers as the circuit enlarges. Because of its triple secondary, this outfit has been named the "3-Way."

This transformer has been designed to give the maximum capacity allowed and approved by the underwriters. Therefore, though low in price, it is said to supplant transformers selling for double its cost.

Difusolite Portable and Floor Lamps Embody New and Distinctive Features.

A serious difficulty encountered with practically all table, piano and floor lamps is that the lamp bulbs themselves are exposed to any one looking under the shade and at the light source. This makes the use of such lamps detrimental to the eyes, particularly of children whose stature is not sufficient to make the shade screen the light from their eyes. Another objection is that the undiffused light from the lamps is reflected from highly glazed papers or other surfaces to the eyes of readers who are not particularly careful about the position in which books or magazines are held while reading. The development of means to overcome these difficulties has been given much thought, and in a new type of lamp now being placed on the market the problem seems to be completely solved in a very ingenious manner.

In this type of lamp, known as Difusolite, the lamp bulb is inclosed by an upturned bowl made of good diffusing

Single Difusolite Lamp.

Double Difusolite Rheo.

glass. This diffuses any direct light coming from the lamp in a downward direction and at the same time reflects a considerable percentage of the light upward to the ceiling which serves to make the unit resemble a semi-indirect fixture. Three forms of the Difusolite lamp are made, of which the first corresponds to the description just given. In this case a pull-chain socket is used, surrounded by a combination socket-cover and shade-holder. This equipment can be attached to almost any table or floor lamp. It is known as the Single Difusolite.

A modified form of this, known as the Double Difusolite, includes the equipment just described, and also has below it another bowl of larger diameter in which two or three lamps are placed. This double arrangement provides for separate control of the lamps in the two bowls. If it is desired to secure a soft semi-indirect light upward, the upper lamp is used. If a well diffused downward light for reading, sewing, etc., is desired, the lamps in the lower bowl are used. By turning on both sets of lamps a combination effect giving maximum illumination throughout the room is obtained. This lamp is operated by means of a switch in the base of the pedestal.

A modified form of the outfit just described, which is known as the Double Difusolite Rheo, is made so as to correspond with the description just given, but also including a dimming device, by means of which the light can be dimmed to almost any desired extent.

In none of these three types of lamps are the bulbs or sockets exposed. The basic features of these lamps are covered by patents. These lamps are adaptable to both simple as well as ornamental table and floor lamps, and in all cases are arranged so that the shade is supported on the rim of the upper diffusing bowl, which does away with the more or less unsightly supporting arms commonly used. These lamps are manufactured by the George C. Lynch Company, 236 Fifth Avenue, New York City.

Motor-Driven Revolving Floor in Restaurant.

Each year the leading cafes in New York City strive for something new and novel with which to attract their patrons. This year was no exception, and one of the more

Difusolite Lamp, Showing Applicability of Principle to Artistic Lamps.

enterprising, Murray's, at Forty-second and Broadway, sprung a surprise on its neighbors and patrons by the introduction of a "revolving dance floor," which is advertised quite extensively. The object of this floor was to add exhilaration and excitement to the disciples of Terpsichore who pursued the intricacies of tango, etc.

In order to provide the motive power for the floor, a Westinghouse type CD 0.5-horsepower motor that operates at 1,165 revolutions per minute was secured. When the installation was started, however, it was found that the speed was excessive, even for the patrons of the Great White Way, and a Westinghouse type DA regulator was added to the equipment, which reduced the speed to such an extent that dancing could be indulged in by anyone so desiring with comfort and pleasure.

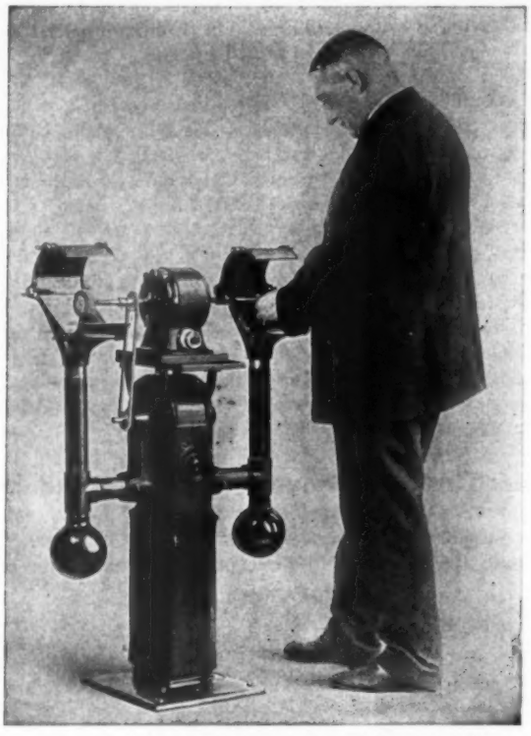


Fig. 1.—Luden's Polishing Lathe with Dust Catcher.

Jeweler's Electric Polishing Lathe.

An electric polishing lathe, that "saves the gold and bags the dust," is shown in the accompanying illustration. The complete outfit consists of a Westinghouse motor mounted on a pedestal equipped with fan, dust traps, and universal hoods. The motor is manufactured especially for J. C. Luden, of Reading, Pa., who mounts it on the pedestal and markets the complete outfit.

When polishing and grinding is being done, the particles of dust flying from the wheels are thrown against the universal hoods and adjustable shields, and drawn down the vertical suction pipes. This dust is then separated from the air during the passage of the air through four traps which dispose of it without clogging the apparatus. Thus all the valuable dust is collected and saved.

In case only the lathe is desired, an outfit such as is shown in Fig. 2 is furnished. The motor is mounted on a low base and furnished with the various attachments for buffing, grinding, drilling, etc.

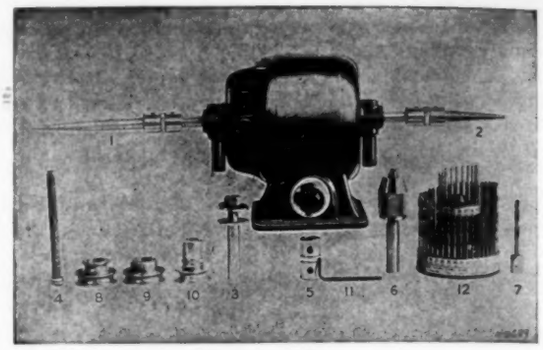
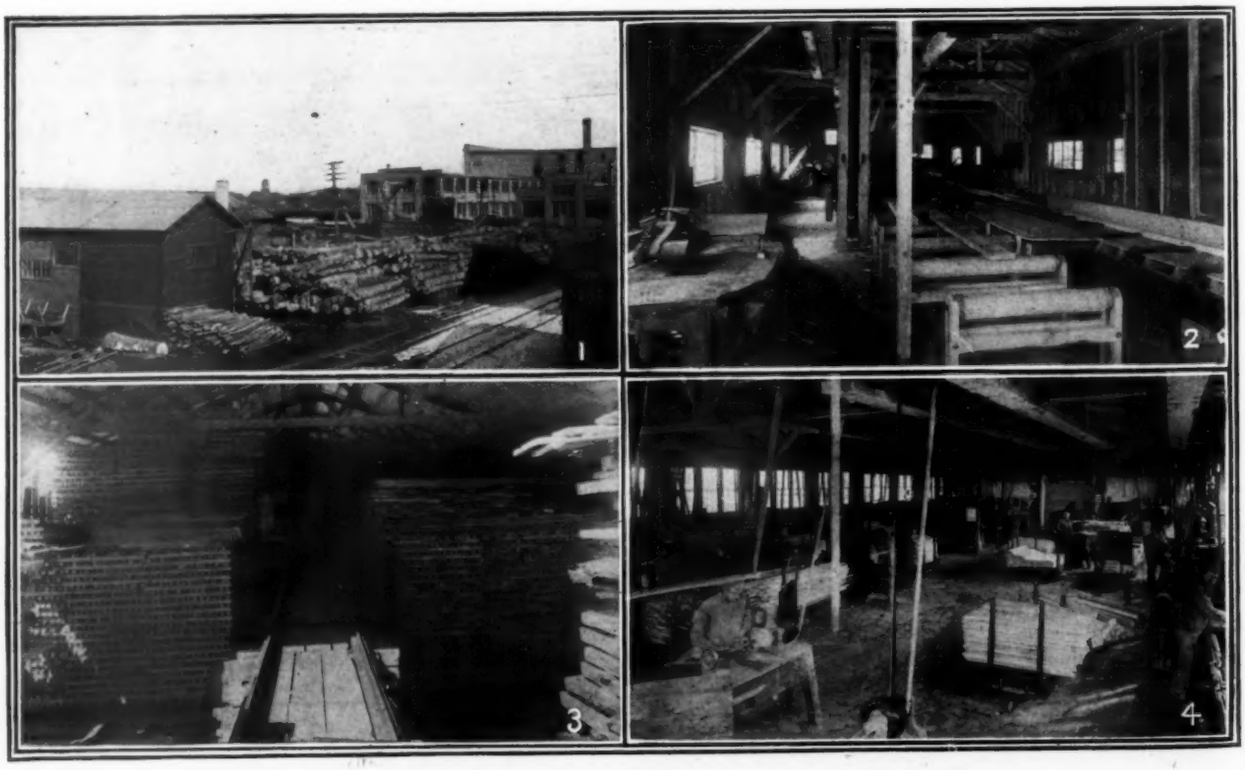


Fig. 2.—Jeweler's Lathe Without Dust Catcher.



Views in the Plant of the Oshkosh Manufacturing Company, Oshkosh, Wis.

An important element in the expediting and cheapening of construction of railroads, electric power, light, telephone and telegrah lines, etc., is the use of dependable time and labor-saving tools. Prominent in the production of such tools is the Oshkosh Manufacturing Company, several views of whose factory are shown above. Fig. 1 gives an idea of the lumber yard where logs of rock maple and fir are received and stored until ready for cutting in the sawmill. The rear of the factory buildings is also shown. Fig. 2 shows part of the sawmill where the logs are cut into sections for seasoning. Fig. 3 is a view of the seasoning and storage sheds where the selected squares from which handles are to be made are air seasoned. Fig. 4 shows the turning department of the woodshop; here tool handles, poles, stakes, etc., are turned and finished by special machinery. The company also has two blacksmith shops, a machine shop, assembling and shipping departments. All of the machinery is electrically driven and the most progressive methods are used throughout the shops.

INDUSTRY ACTIVITIES

American Electrical Works, Phillipsdale, R. I., has issued under date of May 2 its price lists on wire and cable and Enduro spark coils.

The Cutter Company, Philadelphia, Pa., has issued an illustrated booklet showing a number of installations of its I-T-E circuit-breakers.

Stentor Electric Manufacturing Company, New York City, has prepared a booklet on auto telephones, which are a part of its loud-speaking telephone equipment.

King Foundry Company, St. Joseph, Mo., maker of the well known King whiteway standards, announces that its Chicago office recently has been moved to new quarters at 927 Monadnock Building. This office is now in charge of E. M. Hervey.

American Engineering Company, Philadelphia, Pa., has issued a 62-page pamphlet on fuel-burning reports, which is the first of a series compiling the results of various tests on the Taylor stoker. Test-record sheets from a large number of different plants are given.

Underwriters' Laboratories has issued a 38-page booklet which gives an outline of the organization, purpose and methods of the institution. The booklet includes illustrations and a description of the principal offices in Chicago, Ill.; organization chart, explanations of the different classes of service and charges therefor, illustrations of labels and a list of label costs.

Hughes Electric Heating Company, Chicago, Ill., has ready for distribution a new 84-page catalog containing much comprehensive data on electric cooking, results that may be expected, approximate cost, etc. The company also has ready a window display outfit for use by central stations and dealers, comprising posters, cards, ribbons, etc., and complete information and equipment for making an attractive display.

Fan-Motor Manufacturers to Form Association Section.—There will be a meeting of manufacturers of fan motors to consider the formation of a Section in the Associated Manufacturers of Electrical Supplies on May 17, at the Hotel Biltmore, New York City, at 10 a. m. This meeting has been called by Charles E. Dustin, the general secretary of the Association, on the request of a number of manufacturers, and it is believed that the Section will be one of considerable importance and prove of advantage to the members. All manufacturers of fan motors will be welcome at this preliminary meeting. The board of governors of the Associated Manufacturers of Electrical Supplies will hold a meeting at the Hotel Biltmore the same day.

The Electric Storage Battery Company, Philadelphia, Pa., has plans prepared for a new "Exide" Battery Depot, which will be built at Seventeenth and Walnut streets, Kansas City, Mo. This building will be two stories, of concrete and brick construction with stone trimmings, and with large windows to provide a maximum of natural light. The building will be about 70 by 100 feet. The first floor will contain a sales office and battery depot, with provisions for the prompt replacement or repairs of storage batteries for gas-car starting, lighting and ignition and for electric-vehicle propulsion. The second floor will be used for storage and manufacturing purposes. In this depot will be constantly carried in stock a full line of "Exide" starting batteries and parts for nearly every make of car, also "Exide," "Ironclad-exide," "Hycap-Exide" and "Thin-Exide" batteries and parts for pleasure and commercial electric vehicles.

The Louisville Storage Battery Company has opened a new storage battery service station at 726 South Fourth Street, Louisville, Ky., where the company will handle U. S. L. and other batteries. Automobile owners who were solicited were provided with cards which entitled them to free inspection of their storage batteries and to free loan battery service while their own storage batteries are being recharged or repaired.

Mohawk Electrical Supply Company, Syracuse, N. Y., has leased a six-story and basement building, 112 by 21 feet, at 325 South Warren Street, that city, and after extensive alterations and improvements expect to take possession June 1. Heretofore the company has occupied a warehouse separate from their retail department and offices, and the new move will enable it to have the entire business under one roof. The alterations and improvements to be made will be along the lines of placing the company in a position to give its trade the best of service.

Snyder Electric Furnace Company.—A recent article in the trade press called attention to the fact that all the elecric furnaces in Germany, operating under war conditions, were turning out 129,646 metric tons of steel every 12 months. If the Snyder electric steel furnaces recently sold and those now in operation, were mobilized for war service, on 24-hour basis, they would turn out 77,975 tons of steel every 12 months, or within 40 per cent as much steel as all the electric furnaces operating in Germany. Europe is the mother of the electric furnace, and the steel foundrymen in Europe are considered very progressive. Judging, however, from the above facts manufacturers in this country are keenly alive to the value of the electric furnace.

Marconi Company Insures Operators—About 500 wireless telegraphers aboard ships on the high seas, and a few in the war zones, have had their lives insured under a group insurance policy, as employes of the Marconi Wireless Telegraph Company, the contract having been closed recently with the Travelers Insurance Company. The contract also provides for about 500 other employes who are distributed over the American continent. These employes have all been in the company's service a year or more. There are about 900 other employes who will likewise be included when they have completed a year of service for the telegraph company. The insurance amounts to $500 for each of those who have been in its service more than a year, and $1,000 for those who have been in the employ of the company five or more years. The insurance is granted to all without medical examination.

Westinghouse Electric & Manufacturing Company.—A contract was recently signed by the Murray Motor Car Company, Pittsburgh, Pa., for Westinghouse starting and lighting equipment for the new Murray car. The equipment used will be a frame, 750 round-type starting motor operated by screw pinion shift, and a frame, 400 round-type lighting generator, and will be used in connection with the Hirschell-Spillman eight-cylinder engine. The Westinghouse company has recently arranged with the following companies to act as additional service stations: Arthur Jones Electric Company, Chicago, Ill.; East William Street Garage, Decatur, Ill.; Fitch Auto Supply Company, Peoria, Ill.; Central Electric Garage, Springfield, Ill., and W. H. Hamilton, Jefferson, Ill. The company has recently announced an increase in the retail price of its starting and lighting equipment for Ford cars to $85. This increase is due to the marked rise in the cost of raw materials.

LATEST APPROVED FITTINGS

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association

INSULATING SUPPORTS.—General Devices & Fittings Company, 817 West Washington Boulevard, Chicago, Ill.

Insulating supports for busbars and for contact-rails of electrically operated traveling cranes, 600 volts, or less, catalog Nos. L-291A, L-586, L-876.

Listed March 31, 1916.

OUTLET BUSHINGS.—Charles G. Robin, 48 Warren Street, New York, N. Y.

A galvanized iron plate threads on end of rigid conduit and supports a porcelain cap with two or three outlets for conductors. ½-inch to 1-inch sizes.

Listed March 31, 1916.

PLUG-FUSE CUTOUT BASES.—Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins, 31-60 amperes, 250 volts, catalog Nos. 1119-22.

Listed March 31, 1916.

RECEPTACLES, Standard.—General Electric Company, Schenectady, N. Y.

Porcelain base, double-ended receptacles, "G. E." 660 watts, 250 volts, catalog Nos. 42454, GE715.

Standard for use with metal reflectors when wiring is either concealed or carried in a closed metal trough at back of reflector.

Listed March 31, 1916.

REGULATOR FOR HEATING SYSTEMS, Thermostatically Controlled.—Minneapolis Heat Regulator Company, 2747 Fourth Avenue South, Minneapolis, Minn.

A motor thermostatically controlled, and designed, through a gear-train and crankshaft, to regulate dampers of furnaces on air, steam and hot-water and natural-gas systems so as to maintain a predetermined temperature at thermostat. 50 watts, 110-125 volts.

Listed March 31, 1916.

SIGNAL APPLIANCES.—Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins.

A special flush switch controls a 125-volt, signal-lamp circuit which can be opened by a button and closed by solenoid, these forming parts of switch. The circuit of solenoid can be closed by a special pendent bush-button flush switch, catalog No. 487, and includes a small single-pole glass-tube fuse in a special casing. The closing of circuit by flush switch is designed to open circuit of solenoid and pendent switch.

An auxiliary audible signal device consisting of a 3-inch single-stroke bell designed for connection in series with coil of solenoid switch and including a push-button switch whereby bell may be shunted if desired.

An auxiliary silent signal device consisting of a number of miniature lamps which light separate bull's-eyes when individual circuits are closed.

Listed March 28, 1916.

SWITCH BOXES.—Steel City Electric Company, 1207 Columbus Avenue, N. S., Pittsburgh, Pa.

Pressed-steel sectional switch box for flexible tubing, catalog No. 750. This box has removable sides and suitable fastenings whereby a gang box of any desired number of units can be obtained.

Listed March 31, 1916.

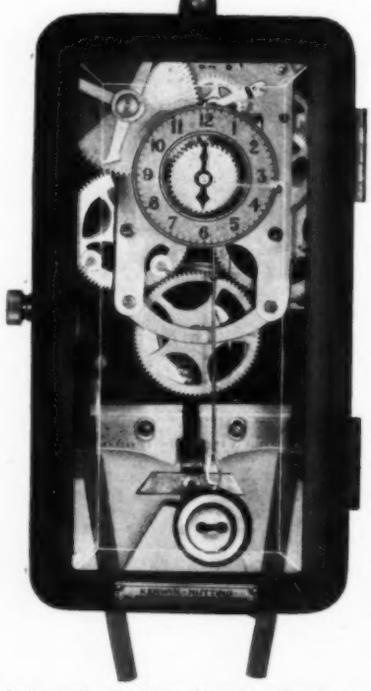
SWITCHES, Automatic.—Berry-McKnight Auto-Electric Time-Control Clock Company, Marine City, Mich.

Time switch, one and two-pole types. A cast-aluminum casing inclosing a clock mechanism with levers operating a mercury-contact knife switch. 30 amperes, 125 volts.

Listed March 27, 1916.

SWITCHES, Automatic.—Kerwin Brothers, Oelwein, Iowa.

This device consists of a cast-iron case inclosing an eight-day clock movement, arranged to operate a standard snap switch in combination with two single-throw, single-pole knife switches in series for manual control. "Kerwin-Nutting," 20 amperes, 125 volts.



Automatic Switch.—Kerwin Brothers.

Listed March 27, 1916.

SWITCHES, Automatic. — United States Air Compressor Company, 6526 Carnegie Avenue, Cleveland, O.

Double-pole, single-break, spring-controlled, diaphragm-operated switch for use with motor-driven air-compressors up to 1 horsepower, 250 volts.

These devices are rated standard as being in compliance with requirement of the National Electrical Code. This rating is to be understood as indicating that in their construction the electrical fire hazard has been reduced to an acceptable degree. It is not to be construed as a recognition of the device for use in connection with automatic sprinklers or similar fire protective equipments for which service their merits have not been investigated.

Listed March 27, 1916.

SWITCHES, Fixture.—Harvey Hubbell, Incorporated, Bridgeport, Conn.

Hubbell switches with pull-socket mechanisms; 3 amperes, 125 volts; 1 ampere, 250 volts; catalog No. 6102.

Listed April 4, 1916.

SWITCHES, Surface Snap.—Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins. With metal covers.

Single-pole; 3 amperes, 250 volts; 5 amperes, 125 volts; catalog Nos. 2690-91.

Listed March 29, 1916.

SWITCHES, Surface Snap.—Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins. With metal covers.

Two-circuit, 5 amperes, 250 volts; 10 amperes, 125 volts; catalog Nos. 2649-63.

Listed March 30, 1916.

WIRE, Rubber-Covered.—Bourn Rubber Company, Providence, R. I.

Marker: One green and one soft uncolored cotton thread, parallel with wire between insulation and braid.

Listed March 28, 1916.

WIRE CONNECTORS.—Frankel Display Fixture Company, 177-179 Hudson Street, New York, N. Y.

Frankel solderless splicing devices for connecting wires. Various styles for No. 0000 B. & S. gage stranded wire.

While these connectors are not considered satisfactory substitutes for soldered joints in general wiring, they are deemed suitable for use in connecting terminal wires of motors, starting compensators and other electrical apparatus to supply mains where it is desirable to frequently disconnect such supply mains from the apparatus and where such connections are open to view. When so used the joints must be well taped.

Listed March 31, 1916.

PERSONAL AND BIOGRAPHICAL

MR. RALPH W. DONGES has been re-elected president of the Board of Public Utility Commissioners of New Jersey.

MR. L. R. FRANCISCO, of Jersey City, N. J., formerly chief engineer for the American Tobacco Company, has been appointed by Mayor Thompson, of Chicago, as the city's representative on the Board of Supervising Engineers, Chicago Traction. He succeeds MR. E. W. BEMIS.

MR. JAMES E. COLE, Wire Commissioner of Boston for the past eight years, has been reappointed by Mayor Curley for a four-year term. During the last year the income of the department has been about $37,000, a large increase over previous years, due to a new fee system put into effect by Commissioner Cole.

DR. W. F. M. GOSS, dean of the college of engineering of the University of Illinois, has, upon the nomination of the American Society of Mechanical Engineers, been appointed by the Secretary of the Navy, as a member of the board of directors of the organization for industrial preparedness for the state of Illinois, and as associate member of the Naval Consulting Board.

MR. R. C. RITCHIE, formerly in charge of the office of the automobile-equipment sales-service station of the Westinghouse Electric & Manufacturing Company, in Chicago, Ill., has been transferred to the main office at Pittsburgh, Pa. He is succeeded in the Chicago office by MR. M. W. HANKS, who was formerly in the sales-service station at Indianapolis, Ind.

MR. WILLIAM F. SIMS, who recently accepted a position in the engineering department of the Commonwealth Edison Company, Chicago, Ill., was born in Green Bay, Wis., in 1875. He was graduated from Armour Institute of Technology in 1897 and entered the engineering department of the Chicago Telephone Company, and was assistant engineer when he left that company in 1901 to take up work in the engineering department of the Chicago Edison Company. In 1907 he became field engineer in the division of electrical distribution, Board of Supervising Engineers, Chicago Traction, having general supervision of outside work during the rehabilitation of the surface lines. In 1911 Mr. Sims entered the employ of the Stone & Webster Engineering Corporation, of Boston, Mass., and had charge of the design and construction of the underground transmission system and also of the substation construction for the Boston Elevated Railway Company. He also had charge of the electrical installation in the Keokuk (Iowa) plant of the Mississippi River Power Company, and was superintendent of construction of the Pensacola (Fla.) power plant and other work of like nature. Mr. Sims was a lieutenant in the Second United States Volunteer Engineers during the Spanish-American War and now is acting chief engineer of the Illinois Naval Reserve.

MR. E. B. ELLICOTT, who has resigned as chief electrical engineer of the Sanitary District of Chicago, was born in Lockport, N. Y., in 1866. He began his career in the electrical industry with the Concordia (Kans.) Electric Light Company in 1885. During 1887 he was engineer and electrician for the Salina (Kans.) Gas & Electric Company and in 1888 he returned to Concordia as superintendent of the plant there. In 1890 Mr. Ellicott entered the employ of the Western Electric Company, Chicago, Ill., and installed steam and electric plants until 1891 when he was placed in charge of the Urbana (O.) Electric Light Company, owned by the Western Electric Company. In 1892 he was made assistant superintendent of construction for the latter company and held this position until 1897 when he was appointed city electrician for the city of Chicago. In 1903 he was given leave of absence to

E. B. Ellicott.

accept the appointment of chief mechanical and electrical engineer of the Louisiana Purchase Exposition at St. Louis, and designed and superintended the installation of a large part of the steam and electrical equipment there. In 1905, Mr. Ellicott resigned as city electrician after his appointment as electrical engineer for the Sanitary District of Chicago. During the 11 years he has held this position, he has superintended the construction of the 32,000-kilowatt hydroelectric plant, transmission system, substations and distribution system. Mr. Ellicott has been a member of the American Institute of Electrical Engineers for many years and was recently made a fellow. He will devote much of his time to his ranch in Central Idaho, and probably will engage in some engineering activity in Salt Lake City, Utah.

MR. J. R. WILSON, formerly sales manager and vice-president of the Crocker-Wheeler Company, of Ampere, N. J., has become associated with the Davison Chemical Corporation, of Baltimore, Md., as manager of its office at 120 Broadway, New York City.

MR. W. C. DAVIET, district superintendent of the Postal Telegraph & Cable Company, was elected president, and MR. JAMES CLARK, JR., of the James Clark, Jr., Electric Company, vice-president of the Louisville (Ky.) Rotary Club, at a meeting held May 4.

MR. HAROLD K. WELD has been placed in charge of the Minneapolis office of the Standard Underground Cable Company, with headquarters at 717 Plymouth Building. The territory covered will include Minnesota, North Dakota and portions of South Dakota, Wisconsin and Michigan. Mr. Weld has previously been working out of the Chicago office, and prior to his connection with the Standard Underground Cable Company was connected with the McRoy Clay Works, Chicago.

OBITUARY.

MR. H. N. FOSTER, traffic superintendent of the Chicago (Ill.) Telephone Company, dropped dead in Winnetka, May 4. He was graduated from Yale in 1896 after which he entered the employ of the Chicago Telephone Company. Mr. Foster was 42 years old.

MR. WILLIAM H. CAPEL, secretary of the New England Westinghouse Company and the J. Stevens Arms & Tool Company, of Springfield, Mass., died April 23. Mr. Capel was born in New York City, March 8, 1867. In April, 1899, he entered the employ of the Westinghouse Electric & Manufacturing Company, holding several positions in the executive offices of this company in New York City, having been for several years past closely associated with Vice-President L. A. Osborne.

MR. HENRY FLOY, who installed the first 25,000-volt underground transmission system, died in New York City, May 5, aged 49 years. He was born in Elizabeth, N. J., and after being graduated from Wesleyan University attended Cornell University, where he received his degree in 1891. During 1892-1898 Mr. Floy was associated with the Westinghouse Electric & Manufacturing Company. In 1898 he was associated with Prof. R. C. Carpenter, of Cornell, as consulting engineer. Three years later he severed his connection with Professor Carpenter and since that time has been in business for himself.

MR. LUCIEN IRA BLAKE, well known electrical engineer, died May 4, in Boston, Mass., aged 62 years. He was the inventor of the telegraph used in submarines and of other electrical devices. Mr. Blake was born in Mansfield, Mass., and after being graduated from Amherst College in 1877 attended the University of Berlin. Following this he was professor of physics and electrical engineering at the Rose Polytechnic Institute in Terre Haute, Ind., and during 1897-1906 occupied the same chair at the University of Kansas. In 1893 he was appointed constructing electrical engineer to the United States Light House Board, and during 1906-1907 was chief engineer of the Submarine Signal Company, of Boston.

CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

GRAY, ME.—Plans are being made for the establishment of electric-lighting and water-works systems here.

SKOWHEGAN, ME.—The Central Maine Power Company, of Augusta, has purchased land and a water-power site here.

CONWAY, MASS.—Negotiations are being made by the Deerfield River Electric Light Company, of this city, and the Greenfield (Mass.) Electric Light & Power Company for the purchase by the latter company of the local electric-lighting plant. If the sale is made the Greenfield company expects to rebuild the lines and make a number of improvements in the power plants at a reported cost of $20,000, and give 24-hour service.

MARLBORO, MASS.—The Marlboro Electric Company is planning to make extensions to its distribution lines.

NEW BEDFORD, MASS.—The New Bedford Gas & Edison Light Company is soon to have a new power station constructed by the Stone & Webster Engineering Corporation, Boston. It will be located at Cannon Street, east of Water Street, and will be of brick pier and curtain wall construction, with metal window frames and wire glass. The main building will be 90 by 144 feet and 65 feet high, and the boiler house 54 by 166 feet and 65 feet high. A coal bunker 25 by 64 feet and 24 feet in height will be constructed.

NORTHFIELD, MASS.—The Athol (Mass.) Gas & Electric Company is planning to furnish energy for street lighting here.

SHIRLEY, MASS.—The Shirley Electric Company has applied to the Massachusetts Gas and Electric Light Commission for authority to issue 275 shares of preferred and 275 shares of common stock, each at $50 par value, to pay for extensions to plant, consisting chiefly of a transmission lines.

TURNERS FALLS, MASS.—The Turners Falls Power & Electric Company has asked permission from the Gas and Electric Light Commission to increase its capital stock by an issue of $1,280,000 in order to pay off indebtedness and to make plant extensions.

WORCESTER, MASS.—The Worcester Consolidated Street Railway Company is planning to place its feeders in Portland Street underground.

CHATEAUGAY, N. Y.—The Chasm Power Company has been granted permission by the Public Service Commission to issue $47,000 in bonds, $5,000 of which will be used for new construction.

BUFFALO, N. Y.—The Public Service Commission has approved the franchise of the Buffalo General Electric Company for the erection of its steam and electric power plant on the river road opposite Grand Island. The plant will cost nearly $5,000,000. The Commission likewise granted the franchise of the company to build transmission lines from the plant to the Buffalo city line and also approved a third franchise of the company for the sale and distribution of power in the city of Tonawanda. The company to date has expended $250,000 in the construction of the plant.

LOWVILLE, N. Y.—The Wetmore Electric Company, which supplies Lowville, Croghan, New Bremen, Beaver Falls and Castorland with energy, will expend $20,000 this season in the building of a transmission line from Lowville to the power plant in Belfort.

PLATTSBURGH, N. Y.—A franchise of the Plattsburgh Gas & Electric Company for electric power lines in this city has been approved by the Public Service Commission.

ROCHESTER, N. Y.—Improved lighting on Main Street is being planned by the Main Street East Improvement Association.

WILLSBORO, N. Y.—The Bouquet Electric Power Company has been granted permission by the Public Service Commission to issue $10,000 in preferred stock, the proceeds of which will be used for new equipment.

BUTLER, N. J.—The Borough Council is planning for an extension to the municipal electric-lighting plant and system. A committee has been appointed to obtain estimates of cost.

JERSEY CITY, N. J.—The Grove Street Merchants' Improvement Association will investigate different types of street lights for the proposed new white-way lighting system on Grove Street.

NEWARK, N. J.—John Campbell & Company, manufacturer of chemicals, will build a power plant in connection with its new plant on Plum Point Lane.

NEWTON, N. J.—The Board of Trade is negotiating with the Township Committee for the installation of a new electric street-lighting system, replacing the gasoline system now in use.

TRENTON, N. J.—The City Commission is having preliminary plans prepared by the Public Service Electric Company for the proposed new street-lighting system in the business district. The use of ornamental iron poles, twelve feet high, is being considered.

MEADVILLE, PA.—An issue of $10,000 in bonds for extensions and improvements to the municipal electric-lighting plant will be considered at an election May 16.

MONT ALTO, PA.—The Waynesboro Electric Light Company is planning to extend its transmission lines to this city to furnish energy for street lighting and private consumption.

WASHINGTON, D. C.—The Potomac Electric Power Company is planning to build a power house on Benning Road northeast. The concrete building to be erected is estimated to cost $25,000.

RICHMOND, VA.—A bond issue of $50,000 for a municipal electric-lighting plant is being contemplated.

MOUNT HOPE, W. VA.—The Mount Hope Electric Power & Water Company has applied for a franchise to construct an electric-lighting system.

SALISBURY, N. C.—The city is considering a proposition for the establishment of a municipal electric-lighting plant.

UNIVERSITY, N. C.—The J. B. McCray Company, of Atlanta, Ga., will receive bids in June for the electric-lighting and heating plant to be installed at the University of North Carolina at an estimated cost of $50,000.

NORTH CENTRAL STATES.

ATHENS, O.—Field Scott, Director of Public Service, is advertising bids for labor and materials necessary to install an ornamental lighting system on Court Street.

CINCINNATI, O.—The Peters Cartridge Company, which is making rapid progress in the construction of a large plant at King's Mill, near this city, is preparing to call for estimates on the building of a power plant for use in the operation of the factory.

CINCINNATI, O.—Plans under which it will be possible to require all companies in the city using overhead wires to place them underground within a definite period are being prepared by City Electrician W. O. Kleine. Under this plan the city is to be divided into districts, in each of which the several companies affected will be given not less than a year to make the change from overhead to underground installation of their wires.

FOSTORIA, O.—City officials are making estimates for the installation of a municipal electric-lighting plant, water-works and sewage-disposal plants.

GERMANTOWN, O.—The City Council has employed S. E. Pollard, of Cincinnati, to render a report and estimate covering the reconstruction of the municipal electric-lighting plant in connection with a proposed new waterworks system and other new construction. Mr. Pollard will make a tentative outline of the work to be done and its probable cost.

HILLSBORO, O.—There is every indication that actual work upon the construction of the Hillsboro, Cynthiana and Chillicothe traction line will be commenced soon after the meeting of the directors, which will be held at Chillicothe, May 15.

MASSILLON, O.—The ten-year contract which the city of Massillon has with the Massillon Electric & Gas Company to supply the city with electric lighting expired May 1. The city is planning to build a new lighting system.

MECHANICSBURG, O.—The proposed change from direct to alternating current for the town is awaiting the result of negotiations between the authorities and the Long Mill & Elevator Company, which owns the distributing system and has been furnishing direct-current service, regarding the purchase of the equipment which has been used by consumers. The price offered by the company is considered too low, being one-tenth of the original cost of the motors and other equipment. The company is under contract to furnish current for eight years longer, and proposes to furnish alternating current from the lines of the Urbana (O.) Lighting Company.

WASHINGTON COURTHOUSE, O.—H. A. Baber & Company, of Chicago, Ill., has purchased the holdings of the Washington Gas & Electric Company, which include the plant and the electric and gas-lighting and heating systems of the city.

GOSHEN, IND.—The Hawks Electric Company, of this city, will extend its transmission lines five miles to Wakarusa.

INDIANAPOLIS IND.—At an expense of approximately $200,000, the Indianapolis Light & Heat Company proposes to build a new substation in Illinois Street, to take care of electric service required in the business district in the vicinity of the Union Station. The plant will be equipped with two 1,500-kilowatt generator sets, one 500-kilowatt generator set and a storage battery with a capacity of 20,000 ampere hours.

MICHIGAN CITY, IND.—The Common Council is preparing to replace the present arc lamps in Franklin Street with 400-candlepower gas-filled lamps.

WINCHESTER, IND.—The County Commissioners are considering an appropriation for an ornamental lighting system on the courthouse grounds.

BECKEMEYER, ILL.—Electric service will be secured from the municipal electric-lighting plant at Carlyle. A transmission line will be erected.

CHICAGO, ILL.—It is reported that the Middle West Utilities Company has purchased a number of electric light and power plants in Southern Wisconsin, including those in Delavan, Lake Geneva, Genoa Junction, Walworth, Fontana and Williams Bay. A new holding company, the Southern Wisconsin Utilities Company, will be formed to take over control of the properties. The company will issue $300,000 bonds to cover the purchase of the properties. Improvements and extensions will be provided for by a later bond issue.

WAUKEGAN, ILL.—The sale of the Illinois division of the Chicago & Milwaukee Electric Railroad was completed by court order last week, the purchasers being Frank A. Vath and Charles White, who represented the reorganization committee, and who paid $2,500,000 for the property. They also purchased the Wisconsin division for $2,050,000. The railroad has been in the federal courts since 1908.

BELDING, MICH.—At the next meeting of the Common Council a committee composed of the officers of the Board of Commerce will present the urgent need of installing boulevard lights along 11 blocks in the business district.

GRAND RAPIDS, MICH.—The Division Avenue Center Improvement Association contemplates the installation of a number of single-lamp standards in Division Avenue.

CASCADE, WIS.—The Cascade Electric Service Company has been organized by Otto Schlenter and others with a capital of $20,000. The company proposes to furnish electric service here.

ELKHORN, WIS.—The Elkhorn Light and Water Commission is advertising for

bids for new machinery and equipment necessary in changing the city's plant to use the service furnished by the Wisconsin Gas & Electric Company. One 40-horsepower motor and one 75-horsepower motor will be purchased first. Bids will be opened and considered this week.

LADYSMITH, WIS.—The City Council is considering plans for a white-way system here.

MILWAUKEE, WIS.—F. G. Simmons, Commissioner of Public Works, has asked for an appropriation of $40,000 of the $750,000 bond issue authorized for street lighting, the money to be used for the erection of emergency lights in some sections of the city pending the installation of the proposed new system.

EYOTA, MINN.—An election will be held May 15 to authorize the sale of the electric lighting equipment a connection with the transmission power line to be built from Winona west.

GLYNDON, MINN.—Business men of this city have requested the Union Light, Heat & Power Company, of Fargo, N. D., to extend its transmission lines to furnish service here.

ISANTI, MINN.—Plans are under consideration for an electric-lighting system, power to be supplied by the Eastern Minnesota Power Company, of Pine City.

LAMBERTON, MINN.—The Electric Light & Power Company at Lamberton has been reorganized and incorporated under the name of the People's Light & Power Company. The incorporators are R. F. Wherland, H. L. Wherland and C. W. Wilkinson, of Minneapolis, and the capitalization is $50,000.

ST. PAUL, MINN.—It is reported that the Northern States Power Company will build a transformer substation in Myrtle Avenue costing about $10,000.

EXCELSIOR SPRINGS, MO.—The Excelsior Springs Water, Gas & Electric Company has filed an application with the Public Service Commission for authority to issue $21,500 in bonds, bearing 6 per cent interest and maturing June 1, 1932. The company proposes to make extensions and improvements costing $36,490.

KANSAS CITY, MO.—An investigation of power plant and substations, cables, and passenger traffic of the Kansas City Railways Company is being made by Edward N. Lee and a company of engineers of the Krehbiel Company, which probably will continue until late in May. The recommendations of the engineers are expected to include new or remodeled power plant, substations and distribution system in view of car distribution and prospective traffic. The Kansas City Railways has now a central power plant at Second Street and Grand Avenue, to which additions have been made from time to time, and from which energy is sold to the Kansas City Light & Power Company.

CONCORDIA, KANS.—It is reported that the A. W. Hughes Company, of Chicago, Ill., has purchased or taken options on the electric-lighting plants at Concordia, Abilene, Junction City, Manhattan and Blue Rapids, and is negotiating for plants in other towns in this section and adjacent to the Blue River. There is considerable undeveloped power at Blue Rapids, and there are other power sites on the river of which the company is seeking control, the purpose, it is said, being to develop them and sell the power in towns of Northern Kansas.

DOWNS, KANS.—The Solomon Valley Light & Power Company is planning to extend its service to Harlan, Kans.

ELKHART, KANS.—An election will soon be held to vote on the question of issuing $8,000 bonds for an electric-lighting plant.

FT. SCOTT, KANS.—The City Council has authorized E. M. Stevens and D. W. Stiles to prepare preliminary surveys and plans for a municipal electric-lighting plant, the construction figures to be available this summer, preparatory to an election in September when a proposal to issue bonds for the building will be submitted. The plant is estimated to cost $200,000.

LYONS, KANS.—The holdings of the Lyons Electric & Manufacturing Company have been purchased by Henry L. Doherty & Company. It is reported that the latter company will make an extension of the transmission line to Nickerson northwest to Sterling and Lyons. It is possible that a transmission line will also be built from Salina to Lyons.

PERRY, KANS.—Fairbanks Morse & Company has completed the installation of power-house equipment for the municipal plant here, a 50-horsepower oil engine and alternator being installed. The company is now placing 50-horsepower engines and alternators in the municipal plants at Sharon Springs and Plains, Kans., and was recently awarded the contract for a 75-horsepower engine and alternator at Wilson, Okla.

SEWARD, NEB.—Application has been made to the State Railway Commission by the Blue River Power Company, of Seward, for permission to construct a 22,000-volt transmission line to Utica, and a 2,200-volt line to Pleasantdale.

DATES AHEAD.

American Institute of Electrical Engineers. Annual meeting, New York City, May 16. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York City.

National District Heating Association. Annual convention, New York City, May 16-19. Secretary, D. L. Gaskill, Electric Building, Greenville, O.

Southwestern Electric and Gas Association. Annual convention, Galveston, Tex., May 17-20. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

Electrical Contractors' Association of Texas. Annual meeting, Galveston, Tex., May 17-18. Secretary, Charles W Graham, Dallas, Tex.

National Electric Light Association. Annual convention, Chicago, Ill., May 22-26. Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York City.

Gas, Electric and Street Railway Association of Oklahoma. Annual convention, Oklahoma City, Okla., May 23-25. Secretary, H. V. Bozell, Norman, Okla.

Electrical Supply Jobbers' Association. Annual summer meeting, Hot Springs, Va., June 6-8. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

Arkansas Association of Public Utility Operators. Annual convention, Little Rock., Ark., June 6-8. Secretary, R. E. Fowles, Pine Bluff, Ark.

American Institute of Chemical Engineers. Semi-annual meeting, Cleveland, O., June 14-17. Secretary, J. C. Olsen, Cooper Union, New York City.

Michigan Section, N. E. L. A. Annual convention cruise, Steamer Rochester, June 20-24. Secretary, Herbert Silvester, Rochester, Mich.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

SOUTH CENTRAL STATES.

LOUISVILLE, KY.—Charles C. Foster, custodian of the county building in Louisville, has applied to the Fiscal Court for the installation of a new power plant to generate electricity for light and power in the courthouse, county jail and armory.

WEST MEMPHIS, TENN.—Plans are being made by W. L. Johnson and others here for an electric-lighting and waterworks system. It is proposed to secure energy from the power plant of the Earle Cooperage Company, of which A. Sweaney is manager.

ARKADELPHIA, ARK.—The Arkansas Light & Power Company, H. C. Couch, president, has recently installed two pressure filters in its waterworks system in this city, one 125-horsepower boiler in its Camden plant, one 125-horsepower boiler in its Magnolia plant, and one mile of distribution-system extensions, together with waterworks-system improvements, at Eldorado. The company is now doing the following construction work, for which contracts for the material have been awarded: New power plant in Marianna, in which will be installed one 300-kilovolt-ampere General Electric generator direct connected to an Allis-Chalmels engine; General Electric feeder and generator panel-boards, and new boiler settings. The distribution system in Marianna is being rebuilt and electrically driven pumps installed at the waterworks plant. At Newport the company is remodeling its power plant, installing one 150-kilowatt General Electric generator direct-connected to a Chuse engine, and rebuilding its distribution system. At Paragould the company is remodeling its boiler room and installing three 200-horsepower Brownell boilers. The company plans to begin work in the near future on rebuilding its distribution systems in Malvern and Morrilton, and installing new pumping equipment in its waterworks plant at the latter place.

ALVA, OKLA.—The Town Council has abandoned the plan of installing a municipal electric-lighting plant and has given a franchise to a private concern, the name of which has not yet been made public.

FORGAN, OKLA.—The city is planning to install a municipal electric-lighting plant.

HYDRO, OKLA.—J. D. Palmer is seeking a franchise to build and operate an electric-lighting plant here.

BARSTOW, TEX.—It is reported that the Barstow Public Service Company is planning to install an electric-lighting plant.

GALVESTON, TEX.—The Brush Electric Company is planning to make plant extensions costing approximately $10,000. Charles M. Rogers, of Meridian, Miss., engineer in the southern district for Henry L. Doherty & Company, operators of the local plant, recently made an inspection of the plant.

JACKSBORO, TEX.—The electric-lighting plant of the Jacksboro Light Company has been sold to the Jacksboro Mill & Elevator Company. Manager J. P. Hackley has announced that new machinery will be installed at an early date, extensions made to the distribution system and 24-hour service given.

KINGSVILLE, TEX.—The Texas Southern Electric Company is planning extensive plant improvements.

LOCKHART, TEX.—The Citizens Light & Water Company, organized here some time ago, has purchased the local electric-lighting and water plant for $75,000. W. B. Swearingen is president of the company and will have general supervision over its management.

WESTERN STATES.

MISSOULA, MONT.—Extensions of the electrification of the Chicago, Milwaukee & St. Paul Railway on the west end of the Missoula division, between St. Regis and Avery, are to be made soon, according to an announcement made by M. E. Buck, of the Montana Power Company, in charge of the electrification work, and Superintendent F. E. Willard, of the Milwaukee road.

PRESCOTT, ARIZ.—The capacity of the Fossil Creek hydroelectric plant of the Arizona Power Company has been raised to 10,000 horsepower by the installation of a second unit, just placed in successful operation. The United Verde Company is using 3,000 horsepower, the Consolidated Arizona Smelting Company 1,000, and the balance is absorbed by the power and domestic uses of the city of Prescott and by a score of mining enterprises.

TEMPE, ARIZ.—The Winslow Gas, Light & Heat Company has been incorporated with a capital stock of $100,000, by I. J. Lipsohn, H. M. Harrison and M. A. Pickett. Phoenix will be the principal place of business. Among other things the company proposes to generate and distribute electrical energy for light and power.

SALT LAKE CITY, UTAH.—Construction will begin at an early date on the electric railroad between Midvale and Bingham Canyon as outlined in the franchise granted Harry S. Joseph.

SALT LAKE CITY, UTAH.—H. A. Strauss, consulting engineer, Harris Trust Building, Chicago, Ill., has been retained by the Salt Lake & Los Angeles Railway Company to undertake the design of the complete electrification and extension of this steam railroad system. The bonds providing for this electrification and extension have been underwritten by C. F. Childs & Company, of Chicago. This is the second steam railroad in Utah to be electrified under the designs of H. A. Strauss, the first having been the Salt Lake & Ogden Railway Company.

COEUR D'ALENE, IDAHO.—Estimates are being prepared as to the expense of installing or purchasing an electric-lighting and water system by the city. The matter of issuing bonds will be submitted to vote.

COTTONWOOD, IDAHO.—The Grangeville Electric Light & Power Company is preparing to construct a large plant on the Clearwater River during the summer to care for the increased demand for electric lights in Central Idaho.

HAILEY, IDAHO.—According to reports, the power plant of the Hailey Electric Company, which has been closed down indefinitely, will be repaired and improved in order to provide an emergency plant in case the Bellevue plant, which is supplying energy for both Bellevue and Hailey, is shut down.

WALLACE, IDAHO.—The Washington Water Power Company, of Spokane, plans equipping properties on Placer Creek, in this vicinity, with apparatus to utilize electrical energy.

BEND, ORE.—In order to meet increasing demand for energy for light and power, the Bend Water, Light & Power Company is installing a new 500-horsepower turbine and plans the installation of a 350-kilowatt generator and ten-panel switchboard.

SEASIDE, ORE.—It is reported that the power plant of the Seaside Power & Light Company has been purchased by the Pacific Power & Light Company, of Portland.

HUNTINGTON BEACH, CAL.—The City Trustees are negotiating with the Pacific Light & Power Company, the Southern California Edison Company and the Southern Counties Gas Company for the installation of 300 additional ornamental lamp posts in the residential district.

LOS ANGELES, CAL.—Additions will be made shortly to the lighting system in the Westgate lighting district in accordance with plans and specifications on file with the Board of Supervisors.

LOS ANGELES, CAL.—It has been announced that E. L. Doheny has contracted privately for lighting West Adams Street with ornamental lights from Figueroa to Hoover Street. The City Council has voted to light Adams Street between Grand Avenue and Figueroa with the same kind of system to preserve uniformity in the lighting scheme.

LOS ANGELES, CAL.—That the city authorities will propose to the Southern California Edison Company and the Pacific Light & Power Company that the city immediately purchase the private distributing systems of those companies without leasing aqueduct power to them for a five-year or ten-year period, was forecast at a recent meeting of the people's power bond committee. The Public Service Commission has sent a report to the City Council recommending that the city make an offer to the companies.

MARE ISLAND, CAL.—The Federal Wireless Company is to supply the navy yard here with a modern 30-kilowatt radio apparatus from its plant at Palo Alto. The yard operators expect to send wireless messages from five to six thousand miles, and the station at Yerba Buena in San Francisco Bay will do the receiving.

RIALTO, CAL.—The Fontana Power Company, of San Bernardino County, has applied to the Railroad Commission for authority to go into business as a public utility, to build a power plant and transmission system, to sell $350,000 worth of bonds, and to mortgage its property to secure this issue. The company also proposes to lease its properties to the Southern California Edison Company for 30 years, and the latter company intends to furnish a number of companies allied with the Fontana company electrical energy from the proposed plant.

RIVERSIDE, CAL.—Chas. H. Dehacour has applied to the Supervisors of Riverside County for a 50-year franchise to erect and maintain a pole, tower and wire system for transmitting electricity along certain public roads of the county. The franchise will be offered for sale on May 17.

SAN FRANCISCO, CAL.—City Engineer O'Shaughnessy is preparing estimates of costs of the proposed extension of the municipal street railway system from the Twin Peaks tunnel down Market Street.

VISALIA, CAL.—The Mt. Whitney Power & Electric Company is now engaged in the erection of a new 33,000-volt transmission line between Visalia and Exeter. Sixty-foot poles are being used to carry the line above the other feeder lines, and the copper is running close to 8,000 pounds to the mile, it is estimated. The work represents an expenditure of about $30,000.

Proposals

ELECTRIC WIRING.—R. H. Thomas, clerk of the School Board, Portland, Ore., will receive bids until 4 p. m., May 18, for electric wiring and conduit work in the second unit of the Franklin High School under construction in Portland.

STORAGE BATTERY.—Sealed proposal will be received by the Commissioner of Gas and Electricity, Room 614, City Hall, Chicago, Ill., May 16 for furnishing, delivering and installing one 44-cell storage battery in new trays, Ironclad Exide or equal, for electric truck, in accordance with plans on file in the office of said off

ELECTRIC DISTRIBUTION SYSTEM.—Sealed proposals will be received May 15 by William Heller, Director of Service, Tiffin, O., for the complete installation of all the poles, wires, posts, underground cables, electric lamps, gas lines and lamps and other construction and appliances necessary for lighting the streets, alleys and public places of the city.

ELECTRICAL WELDING APPARATUS.—Bids will be received by the Bureau of Supplies and Accounts, Washington, D. C., until 10:00 a. m., May 23, for delivering electric welding and cutting apparatus at the Puget Sound Navy Yard, at Bremerton, Wash. Proposals can be obtained from the Navy Pay Office, Lowman Bldg., Seattle, or from the Bureau.

ELECTRIC DISTRIBUTION SYSTEM.—Sealed bids will be received by the town of Guttenberg, Iowa, until 1 p. m., May 22, for a proposed electric distribution system as set forth in plans and specifications prepared by W. H. Grover, consulting engineer, Ames, Iowa. Specifications are on file at the office of the city clerk of Guttenberg and at the engineer's office. Bids will be considered on the city distribution system, labor and material separate. A certified check of five per cent of the bid will be required, all bids to be filed with the city clerk.

ELECTRICAL EQUIPMENT.—The Port of Seattle Commission, C. E. Remsberg, secretary, Seattle, Wash., will receive bids until May 24, for the installation of refrigeration and electrical equipment in the apple storage warehouse, costing approximately $65,000. Bidders are asked to submit alternative figures on plans of their own. Check for five per cent of amount of bid, payable to the Port of Seattle, is required. J. R. West is Chief Engineer of the Port Commission, and plans and specifications for the improvement are on file in his office in the Bell Street Dock.

New Incorporations

NEW YORK, N. Y.—Reliable Electric Motor Company. Capital, $5,000. Incorporators: H. Lippman, S. Lippman and M. Lippman.

INDIANAPOLIS, IND.—Indiana Battery Service Company. Capital, $41,000. Manufacture batteries. Incorporators: H. C. Churchman, G. Taylor and R. L. Brouse.

BOSTON, MASS.—Central Light & Power Company. Capital, $1,000,000. Incorporators: C. C. Guild, Boston; P. T. Stone, Beverly, and G. S. Fuller, West Newton.

NEW YORK, N. Y.—National Current Limitator Company. Capital, $200,000. Electric appliances. Incorporators: J. L. Janover, C. E. Frankel and S. Kaplan, all of 30 Church Street.

NEW YORK, N. Y.—Cities Illuminating Company. Capital, $750,000. Incorporators: Edwin P. Shattuck, W. L. Glenn and W. B. Walsh, all of 26 Exchange Place, New York City.

SYRACUSE, N. Y.—Interchangeable Trolley Switch Company. Capital, $100,000. Electrical devices. Incorporators: W. Dibbs, 400 East Genesee Street; W. A. Wright and C. W. Blodgett.

LOUISVILLE, KY.—Lion Universal Manufacturing Company. Capital, $20,000. Manufacture electrical and mechanical devices. Incorporators: H. J. Wolff, F. A. Lang and R. W. Schanberger.

CLEVELAND, O.—Glenville Equipment Company. Capital, $5,000. Manufacture power, heat and light stations, and distributing systems. Incorporators: M. C. Meyers, C. M. Burke and others.

LOUISVILLE, KY.—Electrical Prepay Meter Company. Capital, $50,000. Manufacture electrical devices and do a general electrical business. Incorporators: N. D. Abell, H. R. Abell and J. D. Sheridan.

NEW YORK, N. Y.—Electrical Talking Sign Company of New York. Capital, $150,000. Electrical advertising systems. Incorporators: O. M. Rogers, 608 Dearborn Street, Chicago, Ill.; A. S. Reid, 1421 Chestnut Street, Philadelphia, Pa., and C. A. Gardner, 52 Vanderbilt Avenue, New York City.

Financial Notes

Westinghouse Electric & Manufacturing Company annual meeting will be held June 14. Books close May 25 and reopen June 15.

Kings County Electric Light & Power Company, at a meeting of the board of directors, held May 1, declared a regular quarterly dividend of two per cent on outstanding capital stock, payable June 1 to stockholders of record at 3 p. m., May 19.

Northern States Power Company has called for payment July 1, 1916, at 105, through the Continental & Commercial Trust & Savings Bank, New York City, the $604,000 first-mortgage six-per-cent bonds of the Interstate Light & Power Company, due serially to July 1, 1932.

A number of Boston bond houses have been asked by the Bay State Street Railway Company to submit bids for an issue of $435,000 Boston & Northern four-per-cent refunding bonds, due 1954, and $550,000 Old Colony Street Railway four-per-cent refunding bonds due 1954.

The Scioto Valley Traction Company has been authorized by the Ohio Public Service Company to issue $200,000 six-per-cent first preferred stock, the proceeds to be used in the purchase of a similar amount of stock of the Columbus Depot Company. The latter company will erect a terminal station in Columbus to cost between $800,000 and $1,000,000. This stock is to be sold at 97.

The Ohio Public Utilities Commission has authorized the Cleveland Telephone Company to sell $2,000,000 common stock at par, and $3,000,000 five-per-cent four-year notes. Proceeds of the stock are to be used to retire notes maturing May 15, and $1,000,000 of the notes are also to be used to retire other notes; while the remainder will be used to pay for extensions and additions to the properties of the company.

The Binghamton Light, Heat & Power Company has sold through W. S. Barstow & Company, Inc., $505,000 five-per-cent first refunding mortgage bonds to N. W. Halsey & Company, and $280,300 six-per-cent cumulative preferred stock to Moors & Cabot, of Boston. The securities of the Binghamton Light, Heat & Power Company were authorized by the Public Service Commission of New York about two weeks ago, settling a controversy of many years' standing. The Binghamton company is controlled by the General Gas & Electric Company.

The New York Upstate Public Service Commission has authorized the Seneca Power Corporation to increase its capital stock from $5,000 to $1,250,000, proceeds of the new stock to be used for the construction of a hydroelectric generating station at the Seneca outlet of the canal at Seneca Falls at which 20,000,000 kilowatt-hours of energy a year will be generated. The construction of this development is made possible by the settlement in court of the water-power claims of a number of mill owners in Seneca Falls. The commission authorized the Central New York Gas & Electric Company to lease and operate the new plant when completed. The cost of the new station and transmission lines will be approximately $2,000,000.

New England Power Company has sold to Kissel, Kinnicutt & Company and William P. Bonbright & Company, New York City, $1,000,000 first-mortgage sinking-fund five-per-cent bonds due 1951, which are being sold on a 5.07-per-cent basis. These bonds are a part of authorized issue of $14,000,000, of which $6,000,000 will be outstanding. In addition to the $1,-

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	May 8	May 1
American Tel. & Tel. (New York)	128	127⅞
Commonwealth Edison (Chicago)	141	141
Edison Electric Illuminating (Boston)	240	237
Electric Storage Battery common (Philadelphia)	59	59
Electric Storage Battery preferred (Philadelphia)	59	59
General Electric (New York)	163½	163
Kings County Electric (New York)	129	129
Massachusetts Electric common (Boston)	6¼	6¼
Massachusetts Electric preferred (Boston)	32¾	33
National Carbon common (Chicago)	172	—
National Carbon preferred (Chicago)	—	—
New England Telephone (Boston)	132	132
Philadelphia Electric (Philadelphia)	27½	27⅞
Postal Telegraph and Cables common (New York)	78¾	78¼
Postal Telegraph and Cables preferred (New York)	66	66
Western Union (New York)	90½	90¾
Westinghouse common (New York)	60¾	58
Westinghouse preferred (New York)	70	70

000,000 bonds just sold, $1,500,000 of these bonds will be offered to holders of bonds of companies to be acquired in exchange for their present holdings and the balance not so exhausted will be sold to other interests affiliated with the company. The proceeds of the bonds are to be used for the acquisition of transmission lines and substations and of a hydroelectric generating station on the Deerfield River with an annual output of 12,000,000-kilowatt-hours of energy.

Dividends.

	Term	Rate	Payable
Cent. Ark. Ry. & Lt. Corp., pf	Q	1.75%	June 1
Illinois Trac., com	Q	.75	May 15
Kings Co. Elec. Lt.&Pw.	Q	2 %	June 1
Mobile Elec., pf	Q	1.75%	May 15
Pac. Gas.&Elec.,first pf.	O	1.5 %	May 15
Pac. Gas & Elec.,orig. pf.	Q	1.5 %	May 15
Tampa Elec	Q	$2.50	May 15
Wash. Ry. & Elec., com.	Q	1.75%	June 1
Wash.-Va. Ry., pf	S	2.5 %	May 1
White (J. G.) & Co., pf.	Q	1.5 %	June 1
White (J. G.) & Co., management, pf	Q	1.75%	June 1

Reports of Earnings.

ALLIS-CHALMERS COMPANY.

Business of Allis-Chalmers Manufacturing Company for first quarter of 1916 is as follows:

	Sales Billed	Net Profit
January	1,366,203	$219,734
February	1,367,736	232,085
March	1,640,901	288,518
Total	$4,374,840	$740,337

At the annual meeting of Allis-Chalmers Manufacturing Company, Grayson M.-P. Murphy, vice-president, Guaranty Trust Company, and Charles F. Pfister, of Milwaukee, were elected to board of directors to fill vacancies of Col. Pabst and William C. Potter, who had previously resigned. Other directors were re-elected. At the meeting of directors of the Allis-Chalmers Manufacturing Company, retiring officers were re-elected.

PACIFIC GAS & ELECTRIC.

	1916	1915
March gross	$1,515,159	$1,589,999
Net after taxes	592,782	702,897
Total income	625,702	720,445
Surplus after charges	287,229	350,310
Three months' gross	4,877,908	4,749,327
Net after taxes	2,086,222	2,113,606
Total income	2,236,682	2,184,920
Surplus after charges	1,216,183	1,080,689
Balance after preferred dividends	878,607	807,343
Twelve months' gross	18,658,882	17,319,438
Net after taxes	7,917,324	7,261,508
Total income	8,410,349	7,542,276
Surplus after charges	4,348,260	2,956,882

BRITISH WESTINGHOUSE.

Report of the British Westinghouse Electric & Manufacturing Company, for the year ended December 31, 1915, compares as follows:

	1915	1914
Trading profit	£293,989	£267,819
Gross profit	293,989	267,819
Debit interest, etc	69,654	69,654
Expended on surplus, lands, etc.	3,236	2,822
Depreciation	44,347	43,716
Net profit	176,752	151,627
Preferred dividends	75,000	75,000
Rate per annum	7½	7½
To reserve, etc	65,241	75,000
Balance for year	36,511	1,627
Brought forward	8,121	6,493
Carried forward	44,632	8,120

Foreign Trade Opportunities

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 20,884. DRY BATTERIES.—An American consular officer in Italy writes that a firm in his district desires to communicate with American manufacturers of electric dry batteries. Quotations and full information should be sent. Correspondence may be in English.

NO. 20,905. ELECTRICAL MATERIAL.—An American consular officer in an insular possession reports that a man in his district desires to receive quotations, catalogs, and full information from American manufacturers of wiring materials and points, insulating materials, electrical fixtures and incandescent lamps. Quotations are desired c. i. f. destination, based on cash against shipping documents on arrival of merchandise, but before delivery. Correspondence should be in Spanish. The man desires to act as general agent.

NO. 20,906. TUNGSTEN FILAMENTS.—A commercial agent of the bureau writes that a firm in the United States has received inquiries from its agent in Japan for tungsten filaments suitable for 10, 16 and 25-candlepower electric bulbs.

NO. 20,946. ELECTRIC PIANOS.—A man in Spain informs an American consular officer that he desires to communicate with American manufacturers of automatic electric pianos, especially those with slot for coins.

Electrical Patents Issued May 2, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,181,112. Electromagnetic and Vacuum Lifter. J. P. C. Charlebois, Toronto, Ontario, Canada. Article lifted secured by suction and magnetism.

1,181,122. Ignition Device for Internal-Combustion Engines. F. V. Eastman, St. Petersburg, Fla., assignor of one-twentieth to A. M. Ballenger, one-twentieth to A. G. Eastman, St. Petersburg, Fla., and three-fourths to F. R. Eastman, Grand Rapids, Mich. For securing to cylinder, comprising spark, inlet and priming plug.

1,181,151. Circuit Plan and Conduit for Motor Vehicles. W. MacGlashan, South Bend, Ind., assignor to the Studebaker Corporation, South Bend, Ind. Housing and terminals for wires.

1,181,186. Automatic Device for Compensating Magnetic Speed-Indicators for Variations in Temperature. E. M. Thompson, assignor to Stewart-Warner Speedometer Corporation, Beloit, Wis. Bimetallic strips support magnetic mass associated with rotating magnet.

1,181,198. Apparatus for Making Threaded Concrete Pipe. J. P. Zwicker, Berkeley, Cal. Has electrically heated thread mold.

1,181,200. Circuit-Interrupting Device. C. Aalborg, assignor to Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. Double-throw knife switch with quick-break blades.

1,181,207. Polyphase Electric Meter. W. M. Bradshaw, assignor to Westinghouse Electric & Mfg. Co. Relates to adjustment of potential and load coils in relation to movable member.

1,181,211. Electrical Measuring Instrument. L. W. Chubb, assignor to Westinghouse Electric & Mfg. Co. Average voltage of alternating wave indicated by wattmeter mechanism measuring hysteresis losses in core.

1,181,216. Apparatus for Transforming Electric Currents. E. Falkenthal, Friedenau, Germany. Transformer comprising vibratory armature for transforming alternating to direct current.

1,181,217. Elevator-Door Locking and Controlling Device. P. F. Foley, New York, N. Y. Details of latches, switches, magnets, etc.

1,181,226. Indicator. O. A. Kenyon, Hastings-upon-Hudson, N. Y. Temperature indicator; lighting of lamps in column follows variations of temperature measured.

1,181,227. Electric Welding. O. A. Kenyon, Hastings-upon-Hudson, N. Y. Regulation for number of welding arcs in series.

1,181,229. Insulator for Trolley-Wire Supports. F. P. Kobert, assignor to Barnes & Kobert Mfg. Co., New Haven, Conn. Insulating mounting for staple.

1,181,236. Electrical Protective Device. P. MacGahan, assignor to Westinghouse Electric & Mfg. Co. Timed relay device for controlling circuit-breakers.

1,181,237. Circuit-Interrupter. J. N. Mahoney, assignor to Westinghouse Electric & Mfg. Co. Details of oil switch having auxiliary breaking contacts.

1,181,247. Electric Sparking Igniter. H. M. Pops, assignor to Maxwell Motor Co., Detroit, Mich. Mounting and gearing of alternating generator and controlling switch on engine casing.

1,181,250. Switching Device. C. Renshaw, assignor to Westinghouse Electric & Mfg. Co. Structural details of flexible shunt.

1,181,267. Switching Device. P. S. Turner, assignor to Westinghouse Electric & Mfg. Co. Supporting device for switch group.

1,181,270. Electrical Measuring Instrument. T. W. Varley, assignor to Westinghouse Electric & Mfg. Co. Special arrangement of windings in wattmeter comprising magnet having constant field.

1,181,298. Adapter for Cutout Blocks. C. B. Fithian, Philadelphia, Pa., assignor of one-third to A. Gentel, Philadelphia, Pa., and one-third to I. L. Stanger, Pensauken, N. J. Adapts fuse plug to cutout block for cartridge fuses.

1,181,306. Automobile-Use Registering Apparatus. W. S. Graham, Norfolk, Va. Clock-driven register controlled by motor-control switch.

1,181,322. Electric Drive for Hoisting and Boom-Lifting Drums. A. Lambert, Newark, N. J. Details of three-drum hoist.

1,181,324. Motor Controller. W. F. Lent, assignor to the Cutler-Hammer Mfg. Co., Milwaukee, Wis. For propulsion motors of ore bridge, etc.

1,181,332. Safety Appliance for Railway Trains. R. C. Millard, Atlanta, Ga. Electromagnetically operated valve in main pipe line of brake mechanism.

1,181,343. Train-Signal System. L. L. Parkhill, Dawson, Pa. Cab signal operated by switches on the cars through circuit formed by car conductors coupled throughout train and telephone sets in cab and caboose connected through one signal conductor and ground.

1,181,348. Dental lamp. H. A. Schwartz, Chicago, Ill. Special lamp casing and arrangement of reflectors.

1,181,349. Mechanical Plating Apparatus. P. T. Sealey, assignor to The Firestone Tire & Rubber Co., Akron, O. Mechanism for manipulating articles in a series of tanks.

1,181,362. Support for Storage-Battery Insulators. C. Ambruster, Philadelphia, Pa. Structure of earthenware device.

1,181,376. Electric Motor. C. H. J. Dilg, New York, N. Y. Pole faces offset and reversible to shift magnetic field axially.

1,181,384. Armature-Shaft Mounting. J. G. Heaslet, assignor to the Studebaker Corporation, South Bend, Ind. For vertical shaft.

1,181,387. Water Cooling and Heating Filter. C. Joerin, Jr., and A. E. Joerin, Detroit, Mich. Heater for hot-chamber controlled by delivery faucet.

1,181,399. Lightning-Rod Connecting Clamp. W. H. McCullough, assignor to J. W. Moorhead, Chicago, Ill. Details of two-part device.

1,181,419. Electric Burglar-Alarm System. J. P. Williams, New York, N. Y., assignor to Duplex Electric Co. Protective-circuit arrangements including high-potential alternating supply, connected through transformer and auxiliary low-potential source.

1,181,420. Electric Burglar-Alarm Protective System for Safes. J. P. Williams, New York, N. Y., assignor to Duplex Electric Co. Base member extending over area of approach has top and bottom members closing circuit an depression or drilling of former.

1,181,423. Apparatus for Measuring Rontgen Rays. K. Bangert, assignor to Siemens & Halske, A.-G., Siemensstadt, Germany. Arrangement of ionization chamber and indicating instrument with switches and circuits therefor.

1,181,425. Spark-Plug. E. Blattman, assignor to Siemens & Halske. Central electrode has bore and other electrode adjustably throttles discharge of gas during expansion.

1,181,427. Means for Signaling Over Electric-Light Circuits or Power Mains. A. C. Brown, Blackheath, London, England. Rapidly oscillating signaling currents superposed on load current.

1,181,440. Insulated Terminal Member. H. R. Edgecomb, assignor to Westinghouse Electric & Mfg. Co. Insulation of conductor at aperture in casing.

1,181,444. Coin Receptacle. J. T. Garton, Toronto, Ontario, Canada. Deposit of coin lights lamp back of transparency.

1,181,445. Annunciator or Signal. C. U. Gammelspacher, Jasper, Ind. Details of mechanism comprising motor-operated reel and radial signal arm.

1,181,446. Electromagnetic Resonator. L. Grubman, assignor to Electric Spark Appliance Co., New York, N. Y. Details of horn having electromagnetically operated diaphragm.

1,181,451. Swivel Cord-Grip for Electric Fixtures. H. Hubbell, Bridgeport, Conn. Gripping members cammed against cord by encircling nut screwing into fixture member.

1,181,483. Meter-Testing Appliance. J. Sachs, Hartford, Conn. Blade-like connector for association with either testing or switch-operating means.

1,181,484. Meter-Testing Switch. J. Sachs, Hartford, Conn. For connecting meter and load circuit with testing circuit.

1,181,486. Art of Producing Musical Tones. M. L. Severy and G. B. Sinclair, assignors to Choralcelo Co., Boston, Mass. For educing a variety of tone qualities from single set of key-controlled tuned sonorous bodies embracing a number of octaves by electromagnetic control.

1,181,505. Magnetizing Device for Wheels. S. D. Colvin, Myrtistown, La. Coil encircling axle has circuit controlled by air pressure from brake cylinder.

1,181,509. Pen. J. L. Devine, Middletown, Conn. Has battery lamp.

1,181,513. Spring Binding-Post. L. Ericson, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Push-button-released spring clamp for terminal.

1,181,524. Arc-Breaking Insulation Block for Electric Switches. H. Hansen, New York, N. Y., assignor to Francis Kiel & Son, New York, N. Y. Movable contact moves into arc-breaking pocket.

1,181,533. Bulb Holder. P. T. Kraft, New York, N. Y. Spring clamp released by pressure between fingers for gripping socket and securing to support.

1,181,543. Safety Flashlight for Elevators. I. J. Rachlin, Newark, N. J. For lighting threshold of elevators.

1,181,544. Headlight and Reflector. H. B. Rand, Merrimac, Mass. Structure of reflector throwing light on street and also forwardly.

1,181,549. Electrolytic Cell. H. T. Shriver, West Orange, N. J. Electrolyzer of the filter press type.

1,181,550. Electric-Lighting. W. C. Starkey, Mansfield, O. Regulation of series lamp circuit with varying voltage.

1,181,551. Electric-Lighting Regulator. W. C. Starkey, Mansfield, O. Related to above; device comprising socket and electromagnetically operated shunt for lamp.

1,181,555. Process of Making Tartaric Acids or Their Compounds. M. Vavgouny, assignor to Royal Baking Powder Co., New Jersey. An alkali glyoxylate reduced by electric current.

1,181,556. Means for Producing High-Frequency Currents. G. Von Arco and A. Meissner, assignors to Gesellshaft Fuer Drahtlose Telegraphie M. B. H., Berlin, Germany. Transformer arrangement.

1,181,559. Intercommunicating Selective Lockout Telephone System. F. W. Adsit, assignor to Adsit General Electric Co., Minneapolis, Minn. For party lines.

1,181,576. Broken-Down Insulating-Joint Protection. S. M. Day, assignor to General Railway Signal Co., Gates, N. Y. For insulated rail joints in a block system.

1,181,577. Bonding-Pin. E. M. Deems, East Orange, N. J. Special plug for securing bond wire to rail.

1,181,593. Electric Interlocking System. W. S. Henry, assignor to General Railway Signal Co., Gates, N. Y. For remote control.

1,181,603. Spark-Plug. S. N. McClean, assignor to McClean, Sperligh & Uhlig Co., Detroit, Mich. Casing shrunk on insulating core to make gas-tight joint.

1,181,623. Electrical Condenser and Manner of Mounting the Same. H. R. Van Deventer, assignor to Splitdorf Electrical Co., Newark, N. J. Core of insulated plates gripped by terminal clamps at opposite ends.

1,181,630. Circuit-Closer for Fire-Alarm Systems. E. Barsony, Castleton-on-Hudson, N. Y. Details of thermal switch.

1,181,640. Locking Switch. G. Burkhardt, Chicago, Ill. Rotary snap switch controlled by lock operated by inserted key.

1,181,656. Pole Changer. C. J. Erickson, assignor to First Trust and Savings Bank, Chicago, Ill. Shifting of battery connections controlled by magnetically operated pendulum.

1,181,661. Display Sign. M. H. Harris, New York, N. Y. Arrangement of lamps in duplex eyeglass advertising sign.

1,181,665. Vehicle Electric Signaling Device. H. H. Hirsch, Philadelphia, Pa. Self contained, detachable, battery light and audible signal for mine car.

1,181,669. Combined Counter and Circuit-Breaker. W. C. Kelly, Hastings, Mich. Contact drum rotated by cam-operated ratchet. (See cut.)

1,181,679. Attachment for Calling Devices. E. A. Mellinger, assignor to Automatic Electric Co., Chicago, Ill. Finger engaging stop for dial with finger holds.

1,181,686. Electrical Switch. G. P. Schmidt, New York, N. Y. Two-push-button snap switch.

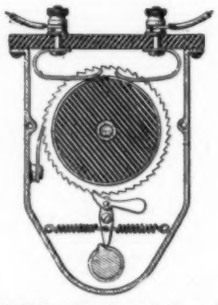
1,181,688. Electric Lamp. A. H. Smith, assignor to Import Sales Co., New York, N. Y. Mounting of socket for candelabra.

1,181,690. System of Motor Control. Halfdan A. Steen, assignor to Allis-Chalmers Mfg. Co. Interrelation of resistance-controlling magnetically operated contactors.

1,181,705. Thermic Circuit-Closer. R. R. Weber, Los Angeles, Cal., assignor of one-third to M. S. Yeager, and one-third to P. F. McKenzie, Los Angeles, Cal. Details of device having contacts held open by heat-affected member.

1,181,706. Porcelain Key-Socket Mechanism. B. C. Webster and G. P. Knapp, assignors to H. Hubbell, Bridgeport, Conn. Switch structure.

1,181,707. Key-Socket Mechanism. B. C. Webster and G. P. Knapp, assignors to



No. 1,181,669.—Combined Counter and Circuit-Breaker.

H. Hubbell, Bridgeport, Conn. Modification of above.

1,181,708. Support and Guard for Telephone Wires. G. W. Welch, Decorah, Iowa. Wires lie between flanges depending from support.

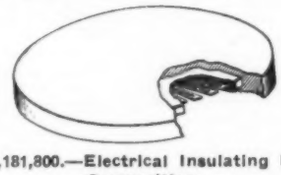
1,181,710. Telephone Receiver. B. D. Willis, assignor to Automatic Electric Co., Chicago, Ill. Diaphragm operating magnet normally neutral and coefficient of self induction of its coil divided by turns between .000094 and .00015.

1,181,711. Electrical-Oscillation System. E. Wilson and W. Hamilton, assignors to Indo-European Telegraph Co., London, England. For producing high-potential discharges.

1,181,722. Broiler. H. P. Ball, assignor to General Electric Co., Schenectady, N. Y. Arrangement of heating unit and switches with oven having adjustable broiler frame.

1,181,723. Manufacture of Armored Wire. H. P. Ball and L. Reichold, assignors to General Electric Co. Protective ribbon is folded about insulation in which conductor is embedded.

1,181,730. Combined Automatic Train Signaling and Control System. J. W.



No. 1,181,800.—Electrical Insulating Plastic Composition.

Buell, Washington, D. C. Normally closed vehicle circuit responds to danger conditions.

1,181,733. Cam-Operated Switch. G. A. Burnham, assignor to General Electric Co. Operating mechanism for double-throw oil-switch.

1,181,736. Venting-Door for Circuit-Breaker Casings. F. E. Case, assignor to General Electric Co. Door opened in response to current flowing through contained electromagnetic switch.

1,181,741. Method of Joining Metals. W. D. Coolidge, assignor to General Electric Co. For securing adhesion of copper to tungsten.

1,181,742. Electrical Contact. W. D. Coolidge, assignor to General Electric Co. Tungsten contact united to ferrous metal base by film of cupreous metal and cupreous metal prevented from creeping up sides of tungsten.

1,181,794. Door. H. C. Osmond, Jr., and A. Peterson, Philadelphia, Pa. For telephone booths.

1,181,800. Electrical Insulating Plastic Composition. C. P. Randolph, assignor to General Electric Co. For heaters; mixture of silica grains and boric anhydrid. (See cut.)

1,181,803. Attachment-Plug. H. R. Sargent, assignor to General Electric Co. Details.

1,181,811. Cored Arc-Lamp Electrode. C. C. Wallace, assignor to General Electric Co. Has separately baked, mineralized core cemented in place.

1,181,828. Spark and Throttle Lever Lock. A. E. Boudreau, Hartford, Conn. Bolt and link arrangement in the segment.

1,181,838. Signal. E. L. Cantrell, Ivy, Cal. Hotel call; clock-controlled circuits set for desired times.

1,181,851. Electrical Indicator for Street Cars. R. M. Craig, San Antonio, Tex. Mechanism for operating reeled name-band.

1,181,867. Timer for Ignition Systems. W. Gadke, Philadelphia, Pa. Details of construction.

1,181,882. Lamp. E. A. Hawthorne, Bridgeport, Conn. Lamp and plug-socket mounting and casing of headlight having rear aperture.

1,181,883. Third-Rail Snow Cleaner. C. F. Henderson and C. D. Winchell, Wampsville, N. Y. Chute on car truck carries scraper at end.

1,181,884. Temperature Alarm. S. I. Hendrix, Crescent City, Fla. Thermometer tube has float-operated contacts.

1,181,894. Vehicle Lamp. T. E. Ivins, assignor to Maunsell Mitchell, Tacoma, Wash. Combination oil-burning and electric lamps.

1,181,896. Lifting Device for Rolling Mills. L. R. Johnson and J. R. Stanley, Zanesville, O. Inclined platform has movable block for holding product received from rolls electromagnetically controlled by product emerging from rolls.

1,181,901. Electromagnetic-Wave Detector. C. S. Lenz, New York, N. Y. Has electrode of lead, copper, iron, aluminum, zinc and magnesia.

1,181,911. Band-Light. J. P. Machovec, Iowa City, Iowa. Battery-lamp structure for detachable connection to music stand.

1,181,947. Telephone. J. O. Cadle, assignor to Telephone & Electric Co. Meridan, Conn. Flush telephone set.

1,181,949. Automatic Signaling and Alarming System for Railways and the Like. O. M. DeMunnick, The Hague, Netherlands. Has balanced vehicle circuits and balanced track circuits; operates by unbalancing of circuits.

1,181,966. Electric Switch. F. W. Cole, Newton Highlands, Mass. Details of magnetically operated switch.

1,181,980. Controlling Apparatus. A. E. Norris, Cambridge, Mass. For motors of grab-bucket hoist.

PATENTS EXPIRED.

The following United States electrical patents expired on May 9, 1916;

624,463. Incandescent Lamp. E. F. Dwyer, Lynn, Mass.

624,472. Submerged Torpedo Tramway. C. T. Finlayson, Denver, Colo.

624,487. Printing Telegraph. K. Himrod, Chicago, Ill.

624,513. Battery Electrode. H. S. Lloyd, Philadelphia, Pa.

624,516. Apparatus Employed in Wireless Telegraphy. G. Marconi, London, England.

624,531. Electrically Operated Rudder-Controlling Mechanism. R. B. Painton, Williamsport, Pa.

624,542. Telephone Register. H. T. Richards, New York, N. Y.

624,552. Composition for Carbons for Electric Lamps. A. O. Simonnier, Vienna, Austria-Hungary.

624,574. Galvanic Battery. J. Sully, New York, N. Y.

624,615. Time Cutout for Electric Lamps. J. H. Boardman, Port Huron, Mich.

624,652. Alternating-Current Motor. A. Heyland, Frankfort-on-the-Main, Germany.

624,666. Telephone System. F. A. Lundquist, Chicago, Ill.

624,696 and 624,697. Telephone Transmitter. J. H. Spencer, New York, N. Y.

624,703. Electric Arc Lamp. C. Tepel, Bennett, Pa.

624,744. Storage or Secondary Battery. H. Blumenberg, Jr., New York, N. Y.

624,813. Means for Regulating Speed of Electric Motors. O. C. Immisch, London, England.

624,815. Commutator Brushholder. G. H. Jantz, Wyoming; W. Leist, Norwood, and O. W. Jantz, Cincinnati, O.

624,824. Adjustable Vibrator for Magnetic Coils. C. A. Keller, Cleveland, O.

624,838. Annunciator for Telephone Switchboards. W. O. Meissner, Chicago.

624,881. Telephone System. D. M. Tnerell, Atlanta, Ga.

624,895. Automatic Magnetic Circuitbreaker. W. M. Scott, Philadelphia, Pa.